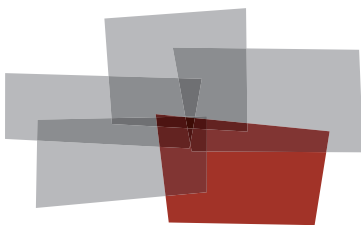**InfoPlus**

Traffic Study
with IP Trunking Analysis
"How well is my Communication Server performing?"

Produced For

Avaya Communication Manager Demo

Customer Number: **12345**
Reflecting information from: **1/4/2018 - 1/8/2018**

Inventory
Configuration
Performance
Security
Backup

All InfoPlus reports for the Avaya product line have been:

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 an 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 depicting 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 Communication Server hardware and software components
- "End-of-Life" analysis pinpoints unsupported equipment
- Access to database for enterprise customers

Configuration – InfoPlus SourceBook
- Details a Communication Server'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 Communication Server'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.

Traffic Study for All Locations

Your Avaya System is configured with multiple Locations, a feature which is often used when a Communication Server is geographically distributed. In order to make this report easier to use in a multiple Location environment, we have included a number of enhanced features. For instance, when displaying information about Trunk Groups, IP Network Regions, or Consoles, we include Location information to help you understand at which site these resources are located. We also have Location summary tables for your Trunk Groups and Consoles, in order to give you an overview of your resource distribution by Location. These features and more are intended to assist with your understanding of how Locations factor into your Traffic results, while enabling you to analyze your entire enterprise network in a single, consolidated report.

Study Methodology

The Avaya Communication 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 Communication Server 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: 1/4/2018 - 1/8/2018
Number of Days in Study: 5
Beginning Hour: 7AM
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 Communication Server, some individual hours of information may have been unobtainable. A bullet (•) indicates all data was retrieved successfully from the Communication Server 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 Communication Server, 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	7 AM	8 AM	9 AM	10 AM	11 AM	12 PM	1 PM	2 PM	3 PM	4 PM	5 PM	6 PM
Thu 1/4/18	•	•	•	•	•	•	•	•	•	•	•	•
Fri 1/5/18	•	•	•	•	•	•	•	•	•	•	•	•
Sat 1/6/18	•	•	•	•	•	•	•	•	•	•	•	•
Sun 1/7/18	•	•	•	•	•	•	•	•	•	•	•	•
Mon 1/8/18	•	•	•	•	•	•	•	•	•	•	•	•

1. Processor Occupancy

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 Communication Server, much like the engine in your car. Just as your car's engine has finite horsepower, the processor in your Communication Server 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 (Fri 1/5/18 11AM-12PM)

Static: 4.0%
Call Processing: 5.0%
System Management: 12.0%
Capacity Remaining: 54.0%
Reserved for Communication Server: 25.0%
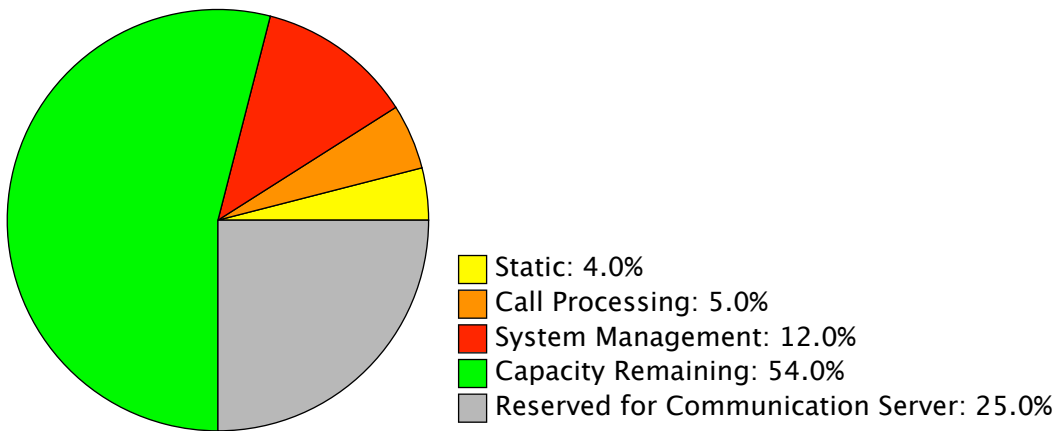
Average Processor Utilization

Static: 3.0%
Call Processing: 3.7%
System Management: 9.1%
Capacity Remaining: 59.2%
Reserved for Communication Server: 25.0%
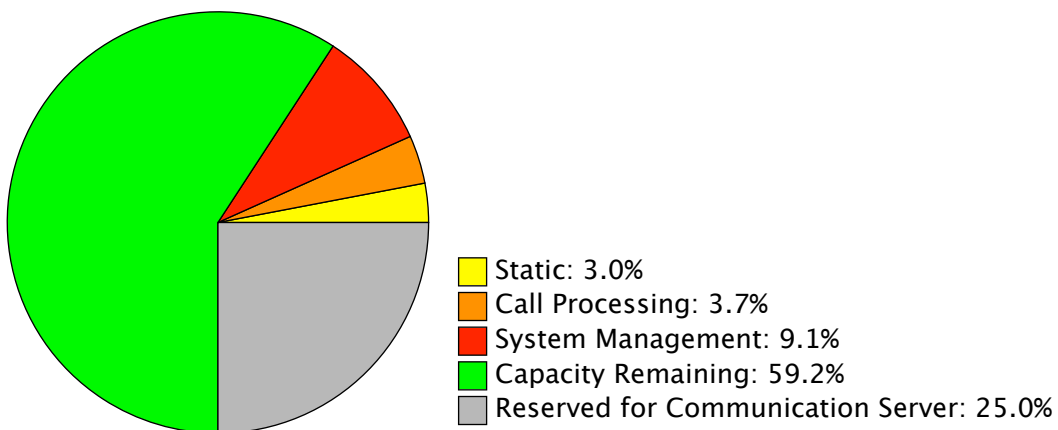
2. Networks

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 Communication Server 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.

Max Bouncing Busy Day
Avaya Communication Manager Demo

Legend: Completed Calls
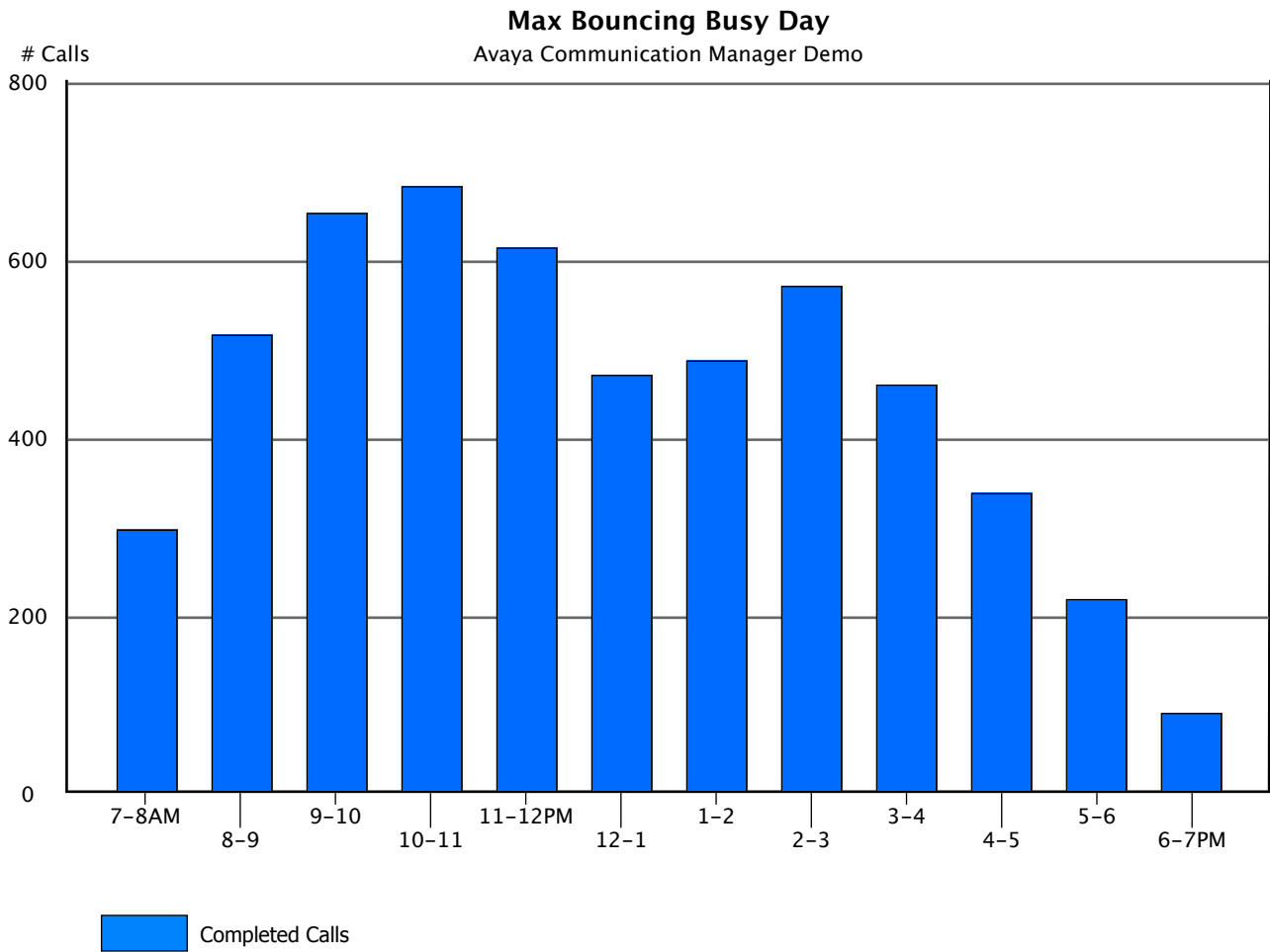
2.2. Average Hourly Traffic

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.

Average Bouncing Busy Day
Avaya Communication Manager Demo
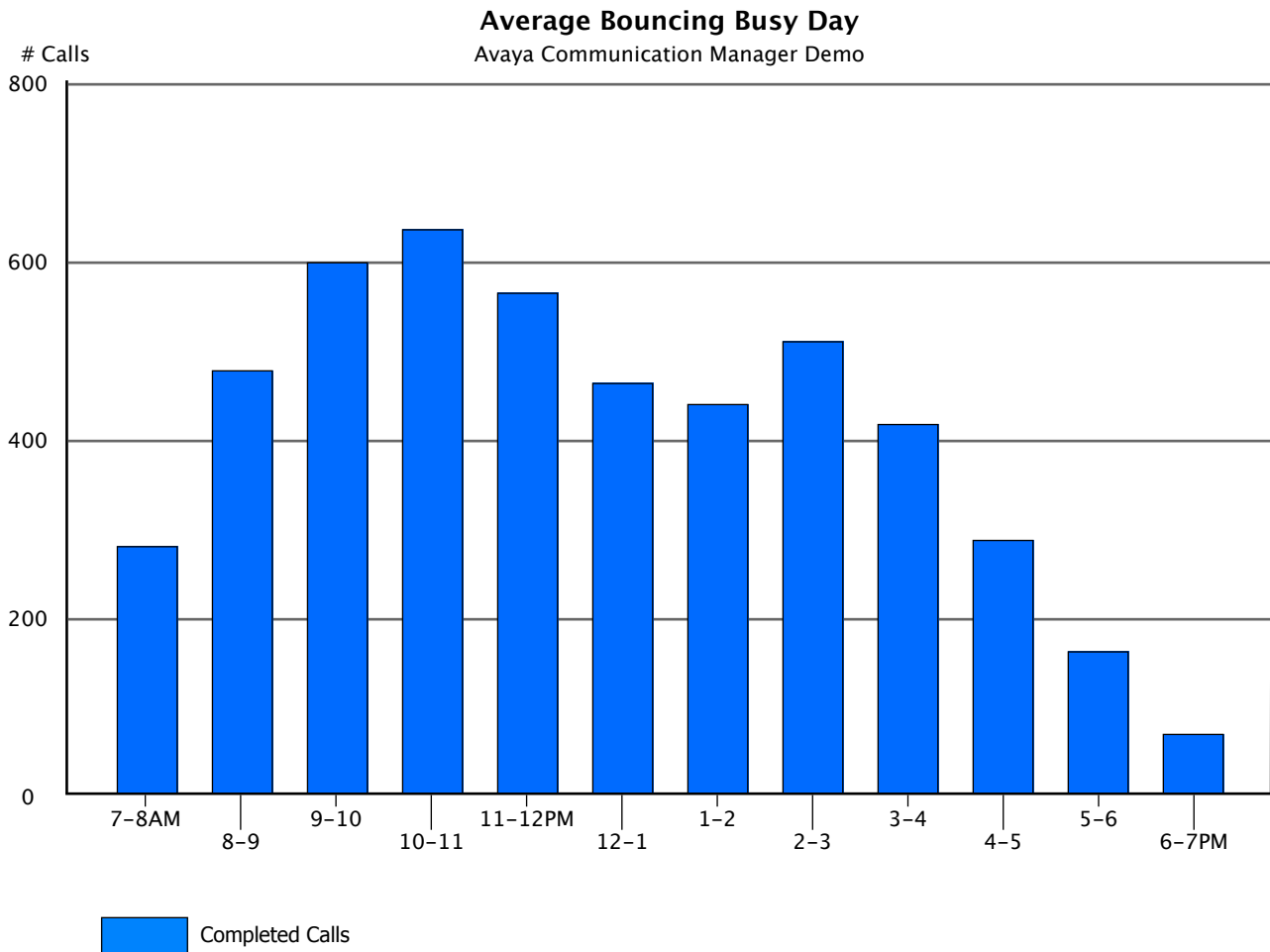
2.3. Port Network Traffic

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.

Port Network TDM Traffic   Port Network Link Traffic   Peak TDM Time Slots   Peak Link Time Slots

Bouncing Busy Hour Traffic By Port Network

% Capacity   Port Network 1
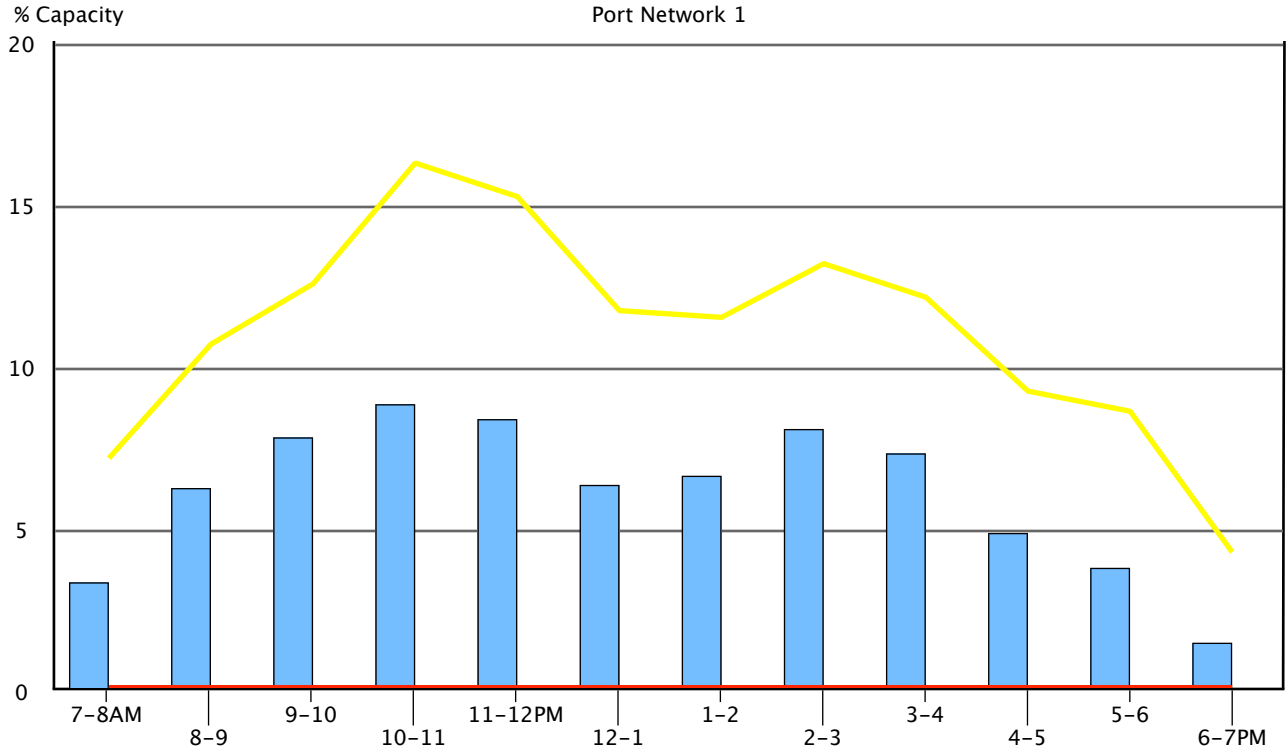
3. Service Denials

3.1. Port Network Blocking

Should system demand be so high that the Communication Server 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.

Port Network Blocking

Port Network	Blocks	Block Type	Hour	Day	Peg	CCS
1	1	TDM	2-3PM	Sat 1/6/2018	2224	1186
1	2	TDM	3-4PM	Sat 1/6/2018	1954	1286

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
Mon 1/8/2018	2-3PM	DTMF	16	4	1
Mon 1/8/2018	3-4PM	DTMF	15	3	0

3.3. CLAN Ethernet Deficiency

This section reports on important metrics related to your CLAN Ethernet performance - namely the occurrence of packet collisions and CRC errors. Packet collisions reduce throughput by requiring that the data be retransmitted. While a small number of collisions in a network is normal, if they become excessive they can seriously degrade the performance of your network and lead to service disruption. Another cause for concern is the existence of Cyclic Redundancy Check, or CRC errors. These occur when the data which was transmitted was damaged in transit, and must be resent. This can be indicative of an impending hardware failure and rob your network of capacity. An excess of either of these two conditions may have a negative impact on the performance of your CLAN Ethernet network.

Measurements of these metrics for each CLAN Board in the system were collected every 15 minutes during the study period. Boards which experienced any CRC errors or a potentially problematic number of collisions (> 50 within 15 minutes) are displayed below. Ideally, there should be zero CRC errors and relatively few packet collisions on the network. If this is not the case, you may want to verify that the affected CLAN boards and related networking equipment are all functioning properly, and that the network topology is properly engineered to minimize congestion. Regularly monitoring these conditions allows you to detect current problems and potentially prevent future failures.

Ethernet Efficiency Problems

CLAN Board: 03B10

Date	Time	CRC Errors	Collisions
Fri 1/5/2018	11:19 AM - 11:34 AM	5	0
Sat 1/6/2018	2:20 PM - 2:35 PM	17	106
Sat 1/6/2018	3:20 PM - 3:35 PM	2	0

CLAN Board: 05B09

Date	Time	CRC Errors	Collisions
Thu 1/4/2018	10:17 AM - 10:32 AM	0	410
Thu 1/4/2018	11:32 AM - 11:47 AM	0	410
Thu 1/4/2018	12:02 PM - 12:17 PM	0	410
Sat 1/6/2018	2:20 PM - 2:35 PM	0	417

4. IP Network Regions

4.1. IP Network Region Traffic

An IP Network Region is a logical grouping of resources related to making Voice over IP calls. IP Network Regions also define settings such as which Codecs are available to any endpoints registered to the Region. Multiple IP Network Regions may be utilized to create sets of endpoints with differing Codec or bandwidth requirements, to assign registered Endpoints to specific Locations, or to apply some logical division to the available hardware resources. The primary hardware resource assigned to an IP Network Region is known as a DSP Resource. DSPs are specialized data processing chips which are used to convert voice into data. Each is each divided into finite units called Resources. The number of DSP Resources available in a region is a factor in how many calls it can handle, the level of quality of those calls, and how much bandwidth they require. These resources must be engineered, adding more as your needs grow, or redistributing to other Regions as necessary.

Each Network Region in this section is presented with several different pieces of information to aid in engineering your DSP Resource utilization.

At the top of each page is that Region's Codec Selection. Choice of Codec is about trade-offs between quality and resource requirements. For example, G.729 family Codecs require less bandwidth, but more DSP Resources while offering reduced audio quality compared to the G.711 family of Codecs. The Bandwidth column in the report shows you the requirement of each Codec before any network overhead is added in order to give you an idea of each Codec's relative network utilization. The Codec order represents your preference in Codec selection when negotiating with another endpoint. If the two endpoints do not have an available Codec in common, the call will not complete, so it is important to make sure you have an appropriate set available.

The next two sections show your DSP Usage, Peg Count data, and vital service availability information about the Network Region that was measured during the study period. Different Codecs can require a different number of DSP Resources per call, which can even vary between the specific equipment which is servicing the call. As a result, all of the engineering data presented has been normalized into G.711 equivalent values.

We first look at this information for the Maximum Busy Hour - the hour of heaviest use in this Network Region over the entire study. Then we show the Average Bouncing Busy hour - this takes the busiest hour from each day and averages the results to give you a more moderated idea of what you need to plan for. The data presented in both of these sections can be interpreted the same way. "In Region Pegs" tell you how many calls that originated in this Network Region were allocated to DSP Resources in the same Region. "Out of Region Pegs", however, indicate that DSP Resources were needed for a call, but had to be allocated from a different Region. This indicates that the Network Region registering these pegs may need to have additional resources assigned to it. Denied Pegs are another indicator of DSP Resource problems. A Peg is Denied if there are no DSP Resources available to service the call, and none could be obtained from any other Network Regions. Denials strongly indicate that more DSP Resources are required in the Network Region re-porting the Denied Pegs.

We attempt to make some recommendations regarding how many DSP Resources are required to achieve a P.01, P.02, and P.05 Grade of Service using statistical traffic engineering theory. On Communication Manager Release 5.2 and later, we also include an "Actual" column showing how many DSP Resources were actually required to service the traffic at its peak. If these values are approaching your total DSP Resources for the Network Region, you should consider adding more. If they are significantly less, you could consider redistributing these resources to Regions which are nearing their limits.

Finally, we present a graph showing how your IP Network Region traffic varies throughout the day. Each hour's data is the average of all the days recorded during the study period, and can help you spot consistent trouble areas.

Network Region: 1 - EuroRegion   Location: 1 - Main

Codec Selection

Order	Codec	Silence Suppression	Frames Per Packet	Packet Size	Bandwidth
1	G.711MU		2	20ms	80.00kbps
2	G.729A		2	20ms	24.00kbps
3	G.711A		2	20ms	80.00kbps
4	G.729B		2	20ms	24.00kbps

Maximum Busy Hour Traffic - Sun 1/7/2018 8-9AM

	Peg Count	Percent
In Region Pegs	45	62
Out of Region Pegs	28	38
Totals	**73**	**100.0%**

Available DSP Resources: 256
DSP Usage: 108 CCS
Denied Pegs: 0 (0% of Pegs)
Time Out of Service: 0% of the hour

DSP Resource Recommendations

Service Objective	P.01	P.02	P.05
DSP Resources Needed	8	8	7

Average Bouncing Busy Hour

	Peg Count	Percent
In Region Pegs	80.6	93.3
Out of Region Pegs	5.8	6.7
Totals	**86.4**	**100.0%**

Available DSP Resources: 256.0
DSP Usage: 98.6 CCS
Denied Pegs: 1.0 (1.4% of Pegs)
Time Out of Service: 0.6% of the hour

DSP Resource Recommendations

Service Objective	P.01	P.02	P.05
DSP Resources Needed	8	7	6

Average Daily Traffic By Hour
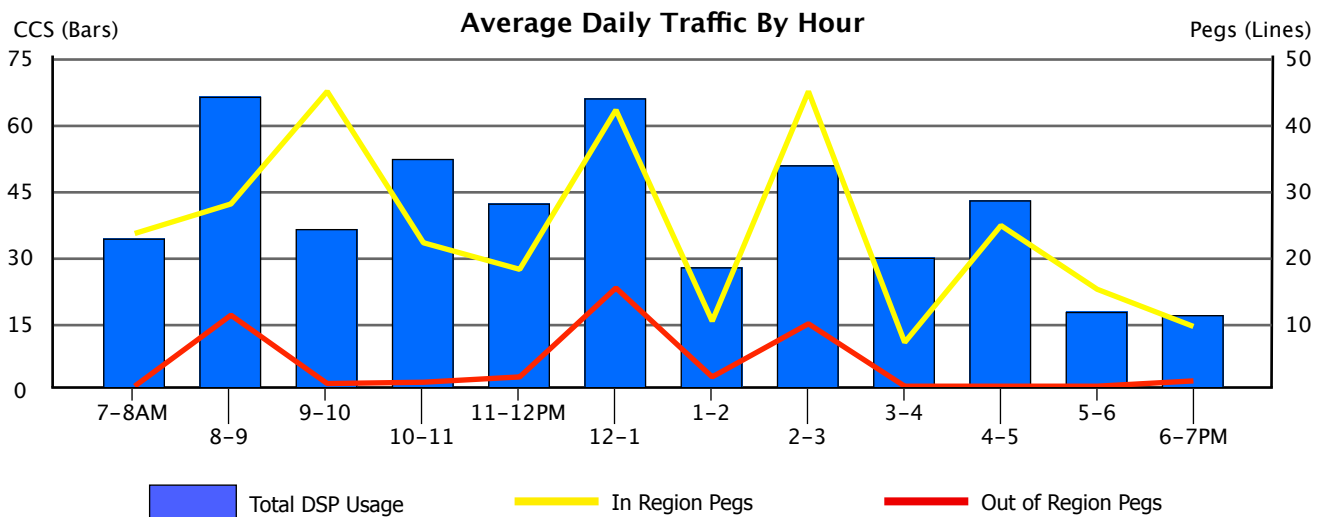
4.2. CLAN Socket Registration

CLANs are vital components involved in controlling your Port Networks, and facilitating communication with other IP devices. Failure to have sufficient CLAN Socket capacity could cause noticeable disruptions in the operation of your communications system.

In the following section, we report on the CLAN Socket Registrations for each Network Region. Each CLAN board can accommodate no more than 500 endpoint connections at one time, while Avaya recommends that you not exceed 400. This report will assist you in detecting impending capacity problems, and balancing load within Network Regions to minimize service disruption in the event of a hardware failure.

Each CLAN board within a Network Region will be presented with both the highest overall registration count seen during the study, and the average of the daily maximum registrations for comparison. The registration volume within each Network Region should be approximately balanced; if any board is handling too much or too little load, you could encounter service disruptions despite having enough physical capacity. Imbalance might be a sign of misconfiguration or malfunctioning hardware and should be investigated. The report below will specifically point out any significant imbalances among the CLAN boards within a Network Region.

In addition to Balance, we analyze all boards for any Denied Pegs or All Sockets Busy conditions that have occurred during the study. This is displayed in the Service Denials section within each Network Region. Any board which exhibited one of these problems during the study will be displayed in a table. These conditions can be serious and indicate that service disruption has likely occurred. Insufficient capacity is one possible cause of these problems; even if Registrations are balanced within the Network Region, having a Maximum Registration value approaching the limit of 400 should be avoided. Additional CLAN boards may be needed to alleviate this problem.

Network Region 1

Location: 1
Maximum Simultaneous Registrations Used (Entire Region): 730
Maximum Simultaneous Registrations Used (Single Board): 247

Maximum Registrations by CLAN Board

CLAN Board	Maximum Registrations			Average Maximum Registrations
	Count	Date	Time	
01C01	242	Sun 1/7/2018	1-2PM	241
01C03	247	Fri 1/5/2018	9-10AM	245
04B03	245	Sun 1/7/2018	1-2PM	244

None of the CLAN Boards in this Region are significantly out of balance.

Service Denials

The following boards experienced service denials, or were reporting All Sockets Busy during the study period. The All Sockets Busy column shows the average percent of time during the hour that all sockets were being used, for those hours in which the condition occurred.

CLAN Board	Total Denials	All Sockets Busy
01C01	5	18%

Network Region 2

Location: 2

Maximum Simultaneous Registrations Used (Entire Region): 67
Maximum Simultaneous Registrations Used (Single Board): 24

Maximum Registrations by CLAN Board

CLAN Board	Maximum Registrations			Average Maximum Registrations
	Count	Date	Time	
05B09	1	Fri 1/5/2018	9-10AM	1
06B04	20	Fri 1/5/2018	11AM-12PM	20
07A03	24	Sun 1/7/2018	1-2PM	23
08A03	24	Fri 1/5/2018	9-10AM	22

The distribution of Registrations amongst CLAN Boards within this Network Region appears to be out of balance. Board 05B09 is handling registration volume greater than 50% below average.

Service Denials

No denials or busy conditions were detected during the study period.

Network Region 3

Location: 3
Maximum Simultaneous Registrations Used (Entire Region): 17
Maximum Simultaneous Registrations Used (Single Board): 17

Maximum Registrations by CLAN Board

CLAN Board	Maximum Registrations			Average Maximum Registrations
	Count	Date	Time	
03A02	17	Fri 1/5/2018	9-10AM	16.5

None of the CLAN Boards in this Region are significantly out of balance.

Service Denials

No denials or busy conditions were detected during the study period.

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 Communication Server, 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.

Location Trunk Group Summary

In a Multi-Location distributed Communication Server, Locations are often used to designate that some resources exist in different physical sites. In the case of Trunking, Locations can play an important role in call routing by sending your calls out through the least expensive path. The following table shows you which of your Trunk Groups contain members that are assigned to each location. This can help you in understanding the traffic trends you see in the subsequent analysis by tying that traffic to a particular location.

Each Trunk Group page also lists the location or locations that the Trunk Group Members belong to, making it easy to determine the layout of your system.

Location #	Location Name	NPA	Trunk Groups
1	Main	973	11
2	Southern Branch	N/A	1
3	Europe	N/A	1, 3-5 and 10

Route Selection

An All Trunks Busy condition on an outgoing Trunk Group is something that your phone system can be configured to avoid. When all the Trunks are busy, incoming calls on that Trunk Group are denied, and outgoing calls cannot be made. However, on outgoing Trunk Groups, your Route Patterns can be configured in such a way that if their first choice of Trunk Group is busy, the call can pass to the next choice, and so on. The table below shows all of the Route Patterns in your Communication Server, along with the list of Trunk Groups those Route Patterns are configured to use in priority order. This can aid you in determining the impact of any All Trunks Busy conditions that may be reported on the following pages.

When diagnosing All Trunks Busy conditions on outgoing Trunk Groups, you should focus on those Trunk Groups which appear as a last choice for any Route Pattern. Outgoing calls are not denied unless there are no remaining

Trunk Groups to fall back on, so the last choice Trunk Group should ideally be able to accommodate any overflow that might occur to prevent gaps in service.

Route Pattern	Trunk Groups in selection order			
1	1	2		
2	1	2	3	4
3	1	14	11	5
4	10	11		
5	1	2		
6	1			

Trunk Group: 1 - OUTSIDE CALL

Location: 2,3

Type: CO   **Equipped:** 18   **Working:** 16   **Queue Size:** 0

Maximum Busy Hour Traffic - Thu 1/4/2018 2-3PM

	Peg Count	Percent
Incoming Calls	17	11.0
Outgoing Calls	137	89.0
Overflow Calls	0	0.0
Totals	**154**	**100.0**

Usage: 217 CCS
Avg. Call Duration: 2.3 min.
All Trunk Busy: 0% of the hour
Blocked/Overflow: 0% of calls

Trunking Recommendations (using Erlang C)

Service Objective	P.01	P.02	P.05
Trunks Needed	14	13	12

Average Bouncing Busy Hour Traffic

	Peg Count	Percent
Incoming Calls	29.2	21.2
Outgoing Calls	108.8	78.8
Overflow Calls	0.0	0.0
Totals	**138.0**	**100.0**

Usage: 203.8 CCS
Avg. Call Duration: 2.5 min.
All Trunk Busy: 0.0% of the hour
Blocked/Overflow: 0.0% of calls

Trunking Recommendations (using Erlang C)

Service Objective	P.01	P.02	P.05
Trunks Needed	13	12	11

Average Daily Traffic by Hour

CCS (Bars)   Calls (Lines)

Legend: Total Usage (blue bars), Incoming Calls (yellow line), Outgoing Calls (red line)

X-axis: 7–8AM, 8–9, 9–10, 10–11, 11–12PM, 12–1, 1–2, 2–3, 3–4, 4–5, 5–6, 6–7PM
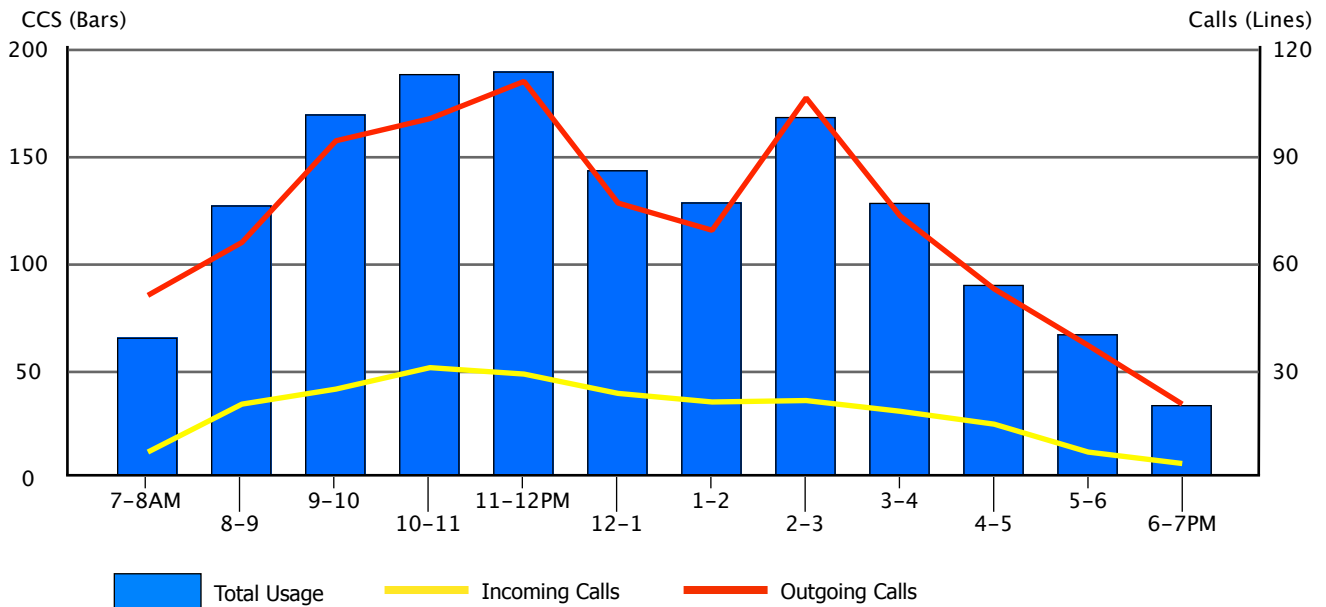
Trunk Group: 3 - Public Main

Type: CO   **Equipped:** 1   **Working:** 1

Location: Europe

Queue Size: 0

Maximum Busy Hour Traffic - Thu 1/4/2018 7-8AM

	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

Trunk Group: 4 - Incoming

Type: DID   **Equipped:** 12   **Working:** 12

Location: Europe

Queue Size: 0

Maximum Busy Hour Traffic - Sat 1/6/2018 10-11AM

	Peg Count	Percent
Incoming Calls	51	100.0
Outgoing Calls	0	0.0
Overflow Calls	0	0.0
Totals	**51**	**100.0**

Usage: 88 CCS
Avg. Call Duration: 2.9 min.
All Trunk Busy: 0% of the hour
Blocked/Overflow: 0% of calls

Trunking Recommendations (using Erlang C)

Service Objective	P.01	P.02	P.05
Trunks Needed	8	7	6

Average Bouncing Busy Hour Traffic

	Peg Count	Percent
Incoming Calls	49.8	100.0
Outgoing Calls	0.0	0.0
Overflow Calls	0.0	0.0
Totals	**49.8**	**100.0**

Usage: 65.2 CCS
Avg. Call Duration: 2.2 min.
All Trunk Busy: 0.0% of the hour
Blocked/Overflow: 0.0% of calls

Trunking Recommendations (using Erlang C)

Service Objective	P.01	P.02	P.05
Trunks Needed	7	6	5

Average Daily Traffic by Hour
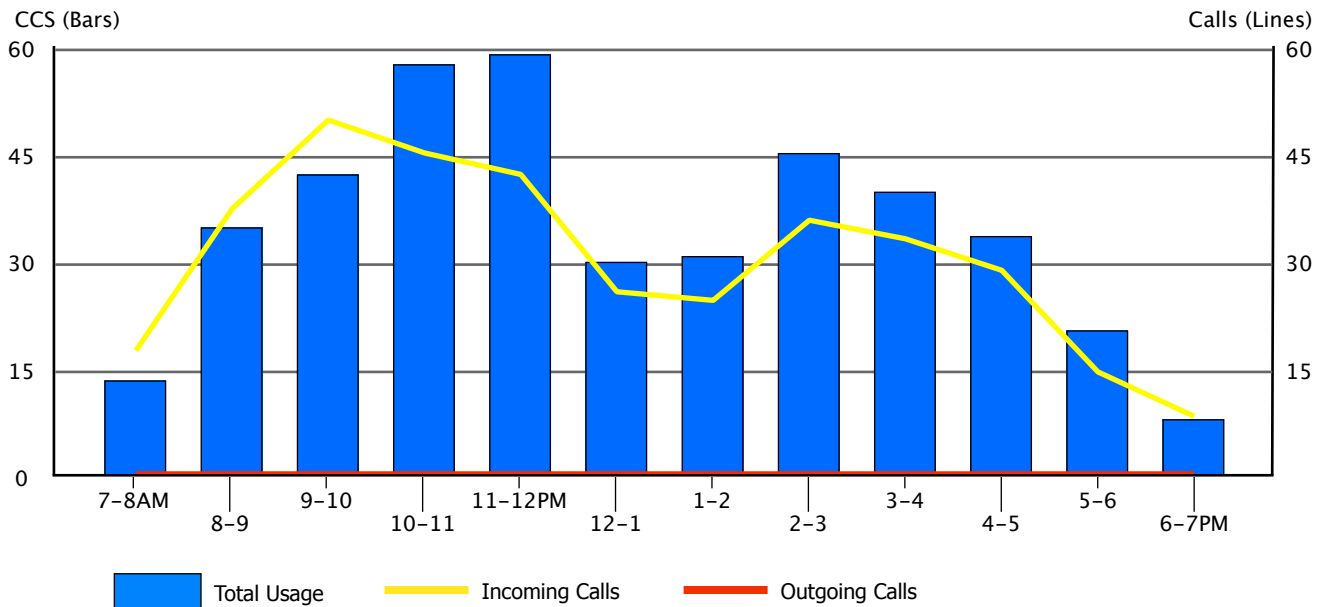
Trunk Group: 5 - Euro TIE

Type: TIE **Equipped:** 6 **Working:** 6

Location: Europe

Queue Size: 0

Maximum Busy Hour Traffic - Fri 1/5/2018 2-3PM

	Peg Count	Percent
Incoming Calls	0	0.0
Outgoing Calls	16	100.0
Overflow Calls	0	0.0
Totals	**16**	**100.0**

Usage: 47 CCS
Avg. Call Duration: 4.9 min.
All Trunk Busy: 0% of the hour
Blocked/Overflow: 0% of calls

Trunking Recommendations (using Erlang C)

Service Objective	P.01	P.02	P.05
Trunks Needed	6	5	4

Average Bouncing Busy Hour Traffic

	Peg Count	Percent
Incoming Calls	2.6	21.7
Outgoing Calls	9.4	78.3
Overflow Calls	0.0	0.0
Totals	**12.0**	**100.0**

Usage: 38.0 CCS
Avg. Call Duration: 5.3 min.
All Trunk Busy: 0.0% of the hour
Blocked/Overflow: 0.0% of calls

Trunking Recommendations (using Erlang C)

Service Objective	P.01	P.02	P.05
Trunks Needed	5	5	4

Average Daily Traffic by Hour
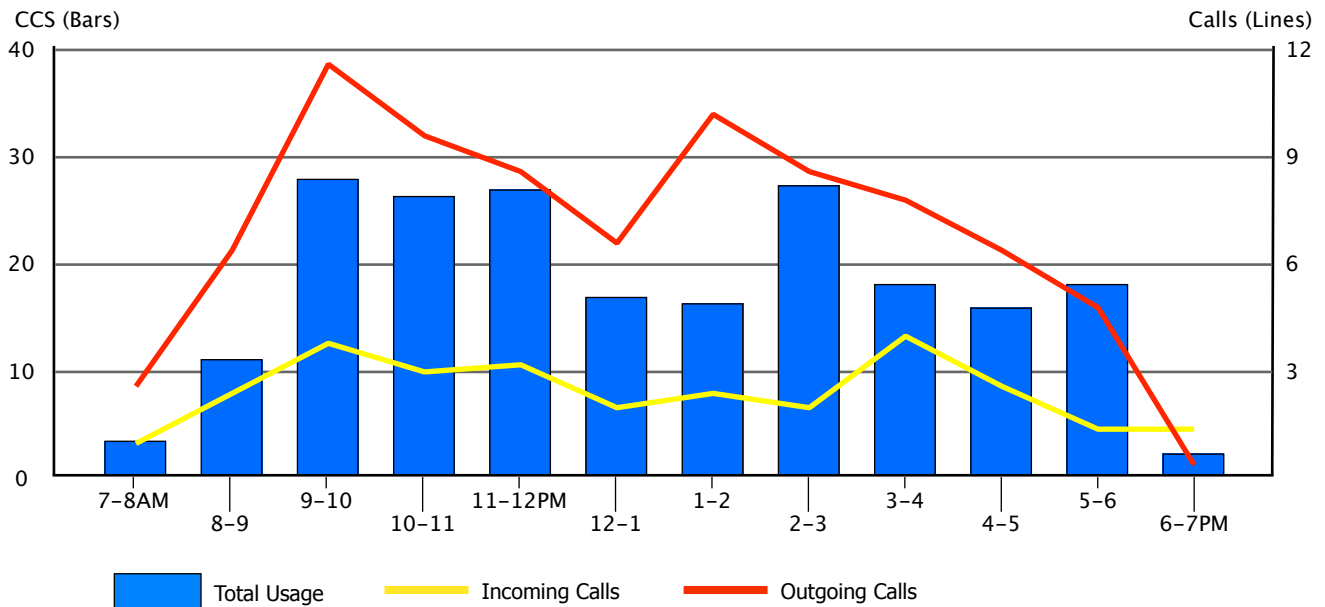
Trunk Group: 10 - London
Type: TIE **Equipped:** 15 **Working:** 15

Location: Europe
Queue Size: 0

Maximum Busy Hour Traffic - Fri 1/5/2018 3-4PM

	Peg Count	Percent
Incoming Calls	85	100.0
Outgoing Calls	0	0.0
Overflow Calls	0	0.0
Totals	**85**	**100.0**

Usage: 200 CCS
Avg. Call Duration: 3.9 min.
All Trunk Busy: 0% of the hour
Blocked/Overflow: 0% of calls

Trunking Recommendations (using Erlang C)

Service Objective	P.01	P.02	P.05
Trunks Needed	13	12	11

Average Bouncing Busy Hour Traffic

	Peg Count	Percent
Incoming Calls	102.4	100.0
Outgoing Calls	0.0	0.0
Overflow Calls	0.0	0.0
Totals	**102.4**	**100.0**

Usage: 183.8 CCS
Avg. Call Duration: 3.0 min.
All Trunk Busy: 0.0% of the hour
Blocked/Overflow: 0.0% of calls

Trunking Recommendations (using Erlang C)

Service Objective	P.01	P.02	P.05
Trunks Needed	12	11	10

Average Daily Traffic by Hour
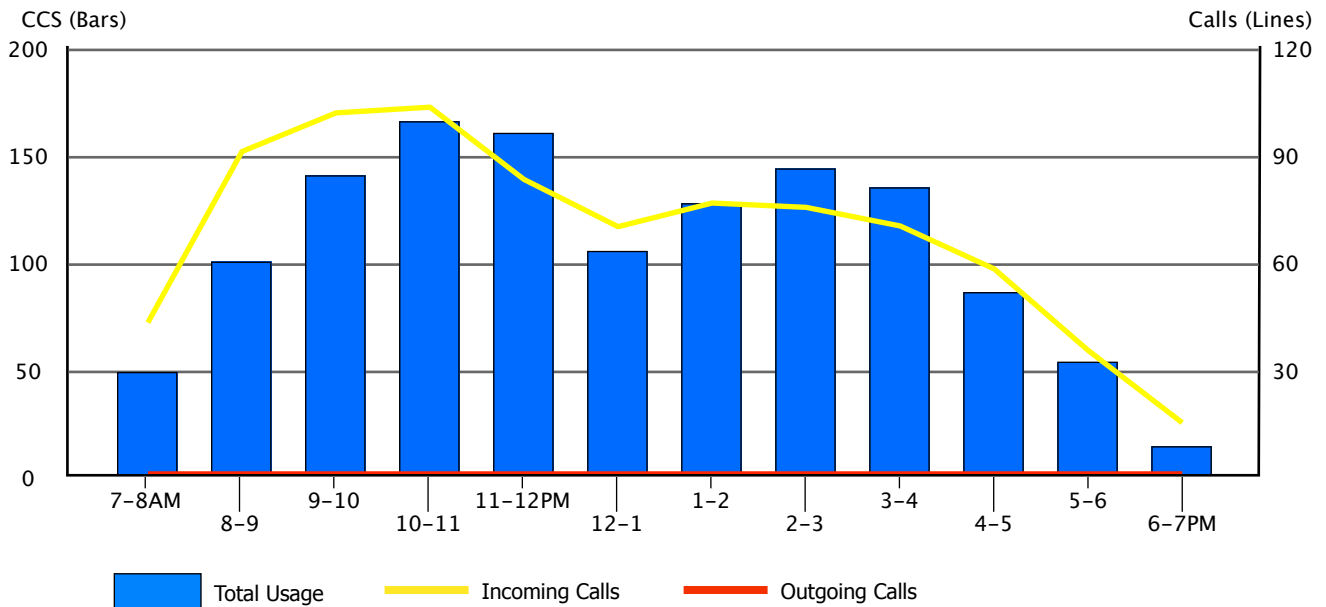
Trunk Group: 11 - Chicago

Type: TIE   **Equipped:** 9   **Working:** 9

Location: Main

Queue Size: 0

Maximum Busy Hour Traffic - Thu 1/4/2018 10-11AM

	Peg Count	Percent
Incoming Calls	0	0.0
Outgoing Calls	55	100.0
Overflow Calls	0	0.0
Totals	**55**	**100.0**

Usage: 87 CCS
Avg. Call Duration: 2.6 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	7	7	6

Average Bouncing Busy Hour Traffic

	Peg Count	Percent
Incoming Calls	0.0	0.0
Outgoing Calls	57.8	100.0
Overflow Calls	0.0	0.0
Totals	**57.8**	**100.0**

Usage: 74.8 CCS
Avg. Call Duration: 2.2 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	7	6	5

Average Daily Traffic by Hour
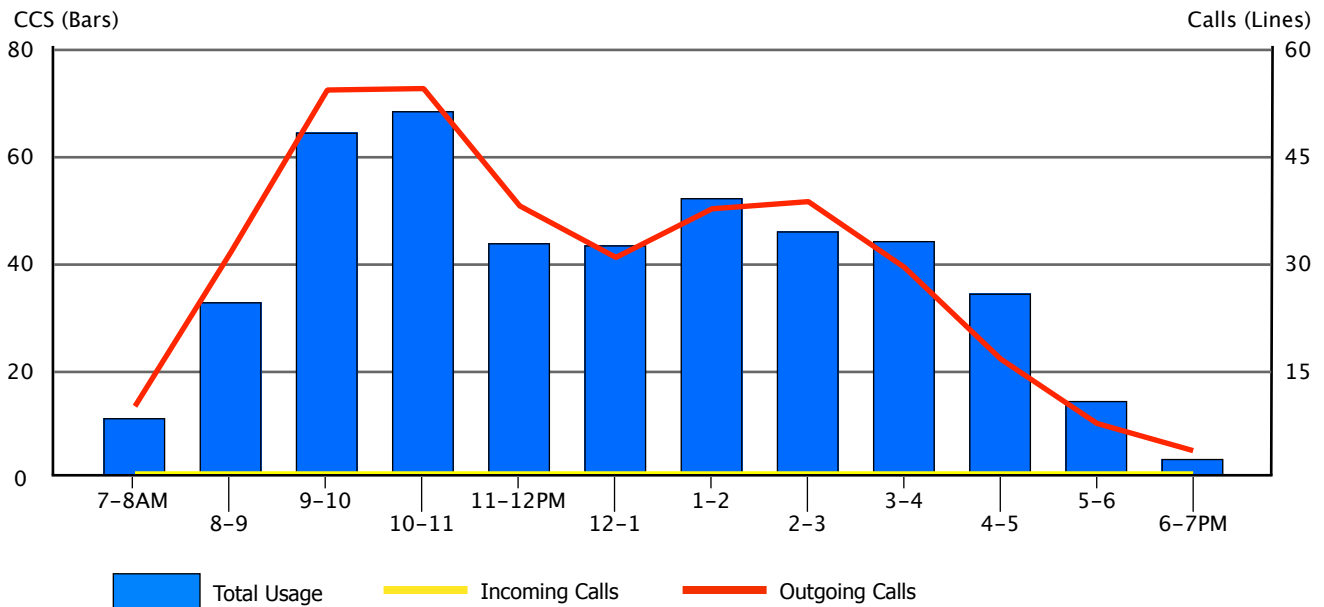
Trunk Group: 14 - Backup

Location: N/A

Type: CO **Equipped:** 0 **Working:** 0 **Queue Size:** 0

Maximum Busy Hour Traffic - Thu 1/4/2018 7-8AM

	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

Note: Additional trunks are needed to improve outgoing service.

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 Grp	Loc	Type	Dir	# Eqpd	# Wrkg	Max Busy Hour			Avg Busy Hour			Add/Delete
						P.01	P.02	P.05	P.01	P.02	P.05	
1	2 and 3	CO	Both	18	16	14	13	12	13	12	11	
3	3	CO	N/A	1	1	1	1	1	1	1	1	
4	3	DID	In	12	12	8	7	6	7	6	5	
5	3	TIE	Both	6	6	6	5	4	5	5	4	
10	3	TIE	In	15	15	13	12	11	12	11	10	
11	1	TIE	Out	9	9	7	7	6	7	6	5	
14	N/A	CO	N/A	0	0	1	1	1	1	1	1	

5.3. Trunk Group Bandwidth Utilization

Introduction to Bandwidth Analysis

This section provides bandwidth engineering projections for each call-carrying Trunk Group that generated traffic during the course of the study. To make the analyses clear, the selected Trunk Groups have been split into two categories: those that are already IP (IP Trunk Groups) and those that are not IP (TDM/Analog Trunk Groups). IP Trunk Groups are presented first, followed by any remaining Trunk Groups.

When considering the capacity of your WAN link for voice traffic, sufficient bandwidth should be purchased such that the peak values can be handled for brief periods of time without disrupting other services sharing the link, and the average bandwidth should be available at all times to ensure adequate voice quality. To illustrate the relationship between peak and average bandwidth, the following three analyses have been performed.

Peak Bandwidth Engineering: This section calculates the peak concurrent connections and the theoretical peak bandwidth. This bandwidth represents the potential maximum bandwidth contribution a Trunk Group can make to the downstream WAN link.
Average Busy Hour Bandwidth: The calculation in this section shows you how much bandwidth a Trunk Group utilizes, on average, during your busiest hours.
Average Daily WAN Bandwidth: The graph in this section depicts Peak and Average bandwidth utilization for the specified Trunk Group over the course of a typical day.

Interpreting the Data

For IP Trunk Groups, the analyses can be used to assess whether or not bandwidth consumption falls within existing engineering tolerances. This information should be compared to prior engineering calculations or direct measurements to ensure sufficient bandwidth is maintained over time. Understanding these key aspects of your IP network are vital for analyzing performance and re-engineering.

For TDM/Analog Trunk Groups, the analyses provide a pre-engineering assessment of theoretical peak and average bandwidth requirements necessary when migrating a Trunk Group to IP. The information will help you to engineer tolerances for a lean network, and to carry out a migration in a cost efficient manner.

The tables above the graph provide key engineering tolerances, while the graph at the bottom juxtaposes the theoretical peak bandwidth and the average busy hour bandwidth for your 'Average Day'. On the graphs, the dark blue bars represent theoretical peak bandwidth and the red line represents the average bandwidth.

When considering what Grade of Service (GoS) to use for engineering IP Trunk Groups, P.01 should be used when there is no fall-back TDM route, or any other means of preventing blocking. Using P.01 for Trunk Groups that do not have a fall-back strategy allows for the bursty nature of IP networks. However, if an IP Trunk Group has a fall-back strategy, such as an alternate TDM route, a GoS of P.10 can be used. A fall-back strategy allows for the use a smaller, less costly facility for the IP link.

Assumptions used for the calculations:

- Poisson was selected to calculate peak concurrent connections due to its slightly more conservative nature.
- For 'Average Bandwidth', 1 Erlang = 36 CCS represents a circuit fully saturated for the duration of one hour.
- If existing codecs are configured in your Communication Server, a codec is selected from among those configured. If no codecs are configured or a codec can't be selected, G.711 64kbps at 20ms is used.
- WAN bandwidth per call includes an 8 byte link-layer overhead. This approximates the average overhead for common WAN links such as PPP, ATM, and Frame-Relay.
- When a codec that is configured to use VAD is selected, a reduction of 35% is applied to all calculated bandwidth values.

Trunk Group: 1 - OUTSIDE CALL
Type: CO

Location: 2,3

Peak Bandwidth Engineering:

1. Measured Trunk Group Usage:
   Max Busy Hour: 217.0 CCS (Thu 1/4/2018 2-3PM)
   Avg Bouncing Busy Hour: 203.8 CCS

2. Theoretical Peak Concurrent Connections (using Poisson):

Max Busy Hour		Avg Busy Hour	
P.01	**P.10**	**P.01**	**P.10**
13	10	13	10

3. Calculated Bandwidth Per Call:
   Codec: G.711, 64.0 kbps at 20 ms
   WAN Bandwidth Per Call: 83.20 kbps

4. Theoretical Peak WAN Bandwidth Requirements:

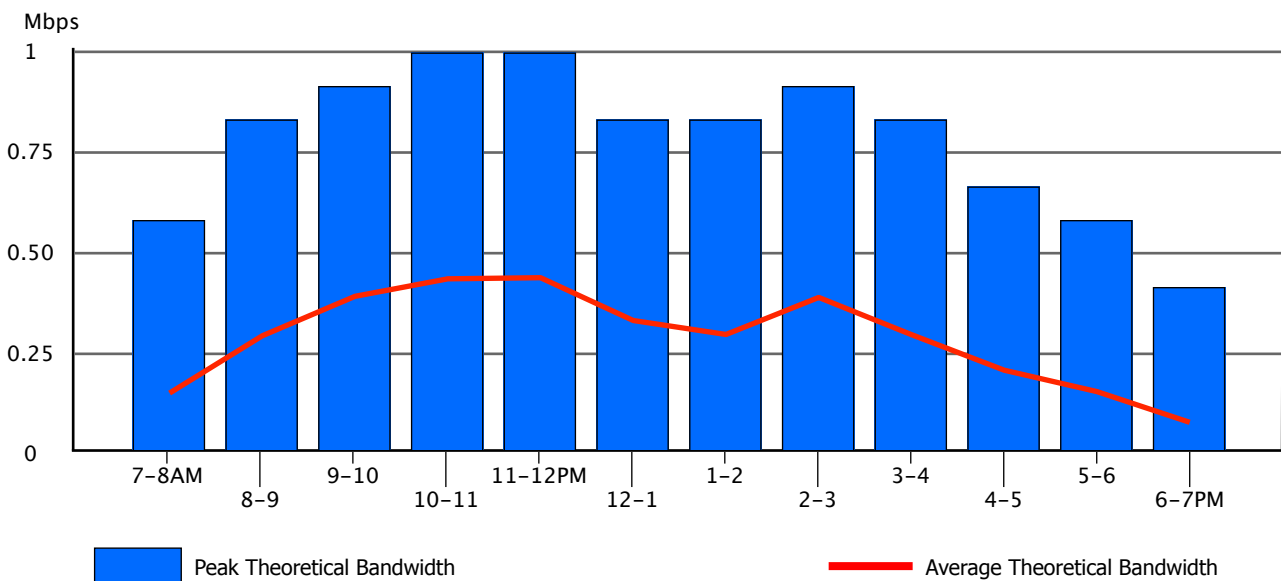| Max Busy Hour Bandwidth		Avg Busy Hour Bandwidth	
P.01	**P.10**	**P.01**	**P.10**
1.08 Mbps	0.83 Mbps	1.08 Mbps	0.83 Mbps

Average Busy Hour Bandwidth:

1. Average Usage:
   Max Busy Hour: 6.03 Fully Saturated Circuits (Erlangs)
   Avg Bouncing Busy Hour: 5.66 Fully Saturated Circuits (Erlangs)

2. Average Busy Hour Bandwidth:

Max Busy Hour	Avg Busy Hour
0.50 Mbps	0.47 Mbps

Average Daily WAN Bandwidth by Hour - (Peak vs. Avg)

Peak Theoretical Bandwidth

Average Theoretical Bandwidth

Trunk Group: 4 - Incoming

Type: DID

Location: Europe

Peak Bandwidth Engineering:

1. Measured Trunk Group Usage:
   Max Busy Hour: 88.0 CCS (Sat 1/6/2018 10-11AM)
   Avg Bouncing Busy Hour: 65.2 CCS

2. Theoretical Peak Concurrent Connections (using Poisson):

Max Busy Hour		Avg Busy Hour	
P.01	P.10	P.01	P.10
8	6	7	5

3. Calculated Bandwidth Per Call:
   Codec: G.711, 64.0 kbps at 20 ms
   WAN Bandwidth Per Call: 83.20 kbps

4. Theoretical Peak WAN Bandwidth Requirements:

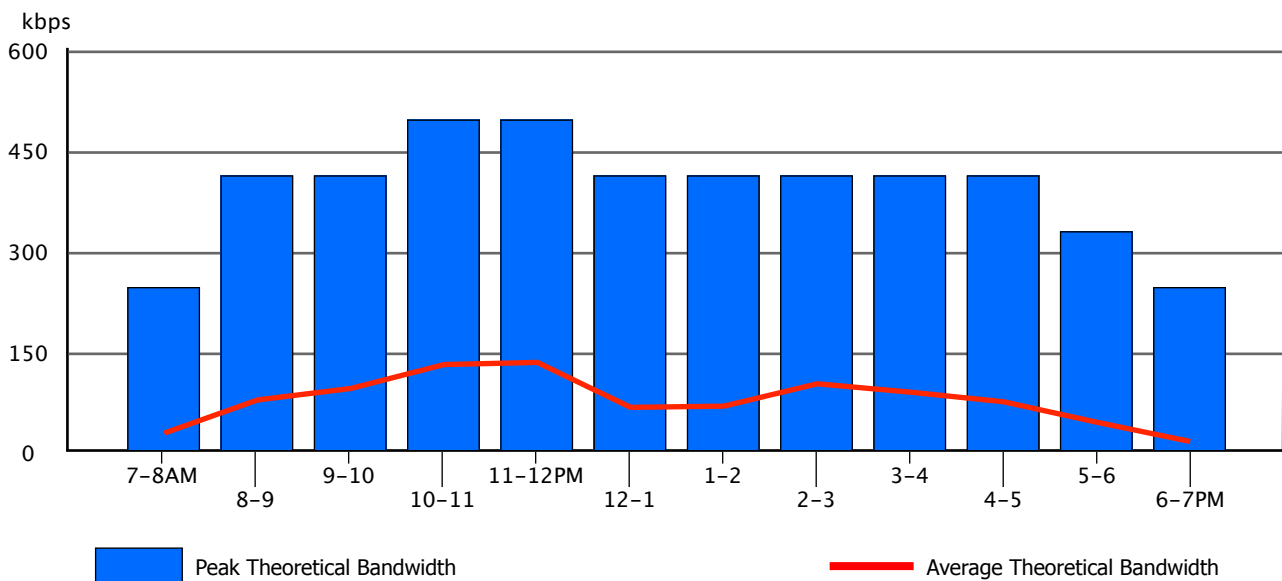| Max Busy Hour Bandwidth		Avg Busy Hour Bandwidth	
P.01	P.10	P.01	P.10
665.60 kbps	499.20 kbps	582.40 kbps	416.00 kbps

Average Busy Hour Bandwidth:

1. Average Usage:
   Max Busy Hour: 2.44 Fully Saturated Circuits (Erlangs)
   Avg Bouncing Busy Hour: 1.81 Fully Saturated Circuits (Erlangs)

2. Average Busy Hour Bandwidth:

Max Busy Hour	Avg Busy Hour
203.38 kbps	150.68 kbps

Average Daily WAN Bandwidth by Hour - (Peak vs. Avg)

Peak Theoretical Bandwidth
Average Theoretical Bandwidth

Trunk Group: 5 - Euro TIE   Location: Europe
Type: TIE

Peak Bandwidth Engineering:

1. Measured Trunk Group Usage:
   Max Busy Hour: 47.0 CCS (Fri 1/5/2018 2-3PM)
   Avg Bouncing Busy Hour: 38.0 CCS

2. Theoretical Peak Concurrent Connections (using Poisson):

Max Busy Hour		Avg Busy Hour	
P.01	P.10	P.01	P.10
6	4	5	3

3. Calculated Bandwidth Per Call:
   Codec: G.711, 64.0 kbps at 20 ms
   WAN Bandwidth Per Call: 83.20 kbps

4. Theoretical Peak WAN Bandwidth Requirements:

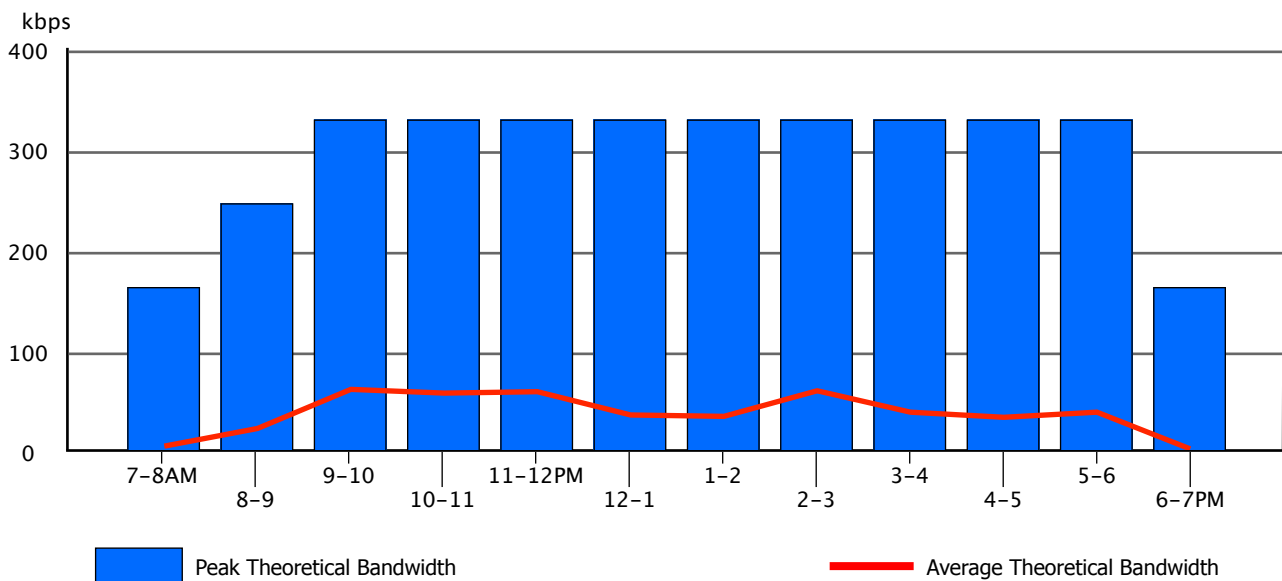| Max Busy Hour Bandwidth		Avg Busy Hour Bandwidth	
P.01	P.10	P.01	P.10
499.20 kbps	332.80 kbps	416.00 kbps	249.60 kbps

Average Busy Hour Bandwidth:

1. Average Usage:
   Max Busy Hour: 1.31 Fully Saturated Circuits (Erlangs)
   Avg Bouncing Busy Hour: 1.06 Fully Saturated Circuits (Erlangs)

2. Average Busy Hour Bandwidth:

Max Busy Hour	Avg Busy Hour
108.62 kbps	87.82 kbps

Average Daily WAN Bandwidth by Hour - (Peak vs. Avg)

Trunk Group: 10 - London

Type: TIE

Location: Europe

Peak Bandwidth Engineering:

1. Measured Trunk Group Usage:
   Max Busy Hour: 200.0 CCS (Fri 1/5/2018 3-4PM)
   Avg Bouncing Busy Hour: 183.8 CCS

2. Theoretical Peak Concurrent Connections (using Poisson):

Max Busy Hour		Avg Busy Hour	
P.01	**P.10**	**P.01**	**P.10**
13	10	12	9

3. Calculated Bandwidth Per Call:
   Codec: G.711, 64.0 kbps at 20 ms
   WAN Bandwidth Per Call: 83.20 kbps

4. Theoretical Peak WAN Bandwidth Requirements:

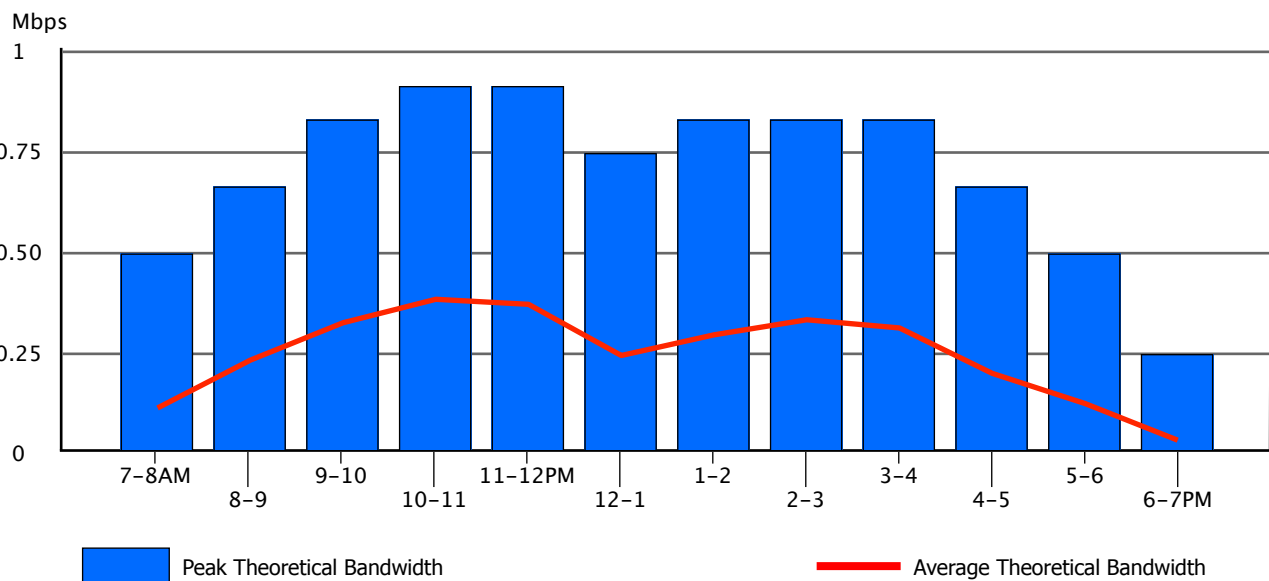| Max Busy Hour Bandwidth		Avg Busy Hour Bandwidth	
P.01	**P.10**	**P.01**	**P.10**
1.08 Mbps	0.83 Mbps	1.00 Mbps	0.75 Mbps

Average Busy Hour Bandwidth:

1. Average Usage:
   Max Busy Hour: 5.56 Fully Saturated Circuits (Erlangs)
   Avg Bouncing Busy Hour: 5.11 Fully Saturated Circuits (Erlangs)

2. Average Busy Hour Bandwidth:

Max Busy Hour	Avg Busy Hour
0.46 Mbps	0.42 Mbps

Average Daily WAN Bandwidth by Hour - (Peak vs. Avg)

Peak Theoretical Bandwidth
Average Theoretical Bandwidth

Trunk Group: 11 - Chicago
Type: TIE

Location: Main

Peak Bandwidth Engineering:

1. Measured Trunk Group Usage:
   Max Busy Hour: 87.0 CCS (Thu 1/4/2018 10-11AM)
   Avg Bouncing Busy Hour: 74.8 CCS

2. Theoretical Peak Concurrent Connections (using Poisson):

Max Busy Hour		Avg Busy Hour	
P.01	P.10	P.01	P.10
8	5	7	5

3. Calculated Bandwidth Per Call:
   Codec: G.711, 64.0 kbps at 20 ms
   WAN Bandwidth Per Call: 83.20 kbps

4. Theoretical Peak WAN Bandwidth Requirements:

| Max Busy Hour Bandwidth		Avg Busy Hour Bandwidth	
P.01	P.10	P.01	P.10
665.60 kbps	416.00 kbps	582.40 kbps	416.00 kbps

Average Busy Hour Bandwidth:

1. Average Usage:
   Max Busy Hour: 2.42 Fully Saturated Circuits (Erlangs)
   Avg Bouncing Busy Hour: 2.08 Fully Saturated Circuits (Erlangs)

2. Average Busy Hour Bandwidth:

Max Busy Hour	Avg Busy Hour
201.07 kbps	172.87 kbps

Average Daily WAN Bandwidth by Hour - (Peak vs. Avg)

Peak Theoretical Bandwidth   Average Theoretical Bandwidth
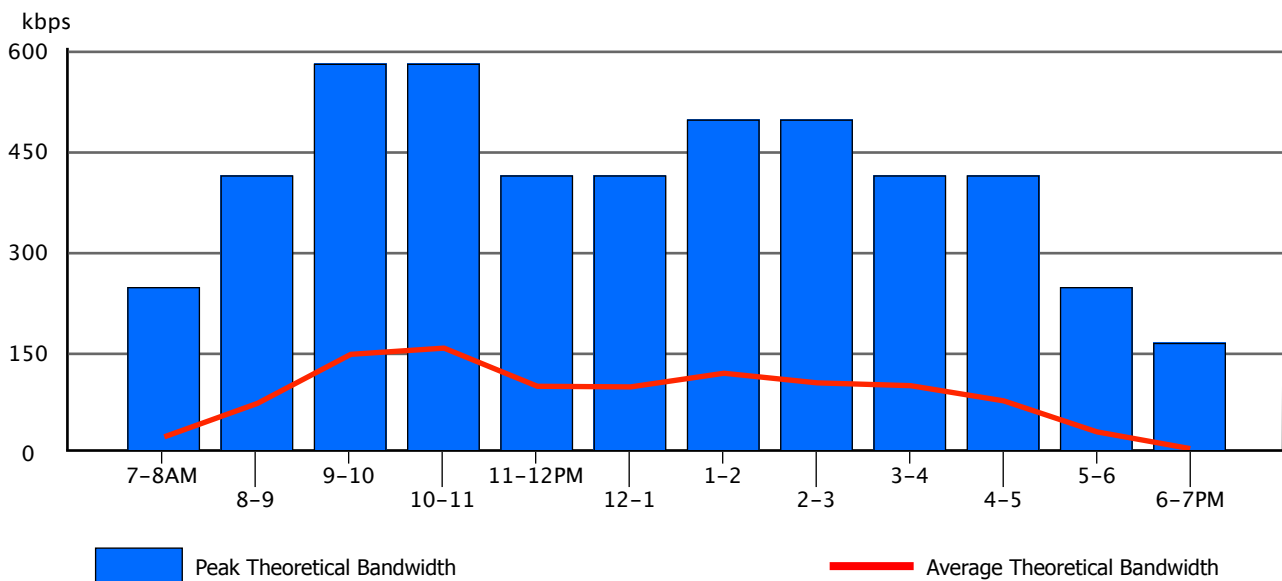
5.4. InfoPlus Aggregate Bandwidth Tool

About the Tool

This InfoPlus Traffic Study includes an online traffic analysis component in the form of a web application, the InfoPlus Aggregate Bandwidth Tool, which allows you to dynamically explore the network bandwidth required to support the voice traffic measured during the course of the study.

Moving traditional TDM/analog service to VoIP trunking or monitoring an existing deployment presents new engineering challenges. The InfoPlus Aggregate Bandwidth Tool allows you to apply your understanding of the voice traffic to the engineering process. Accurately calculating the bandwidth demands that will be placed on your IP facility will help to reduce your resource, engineering and maintenance costs.

As the data network is a shared facility, one cannot simply sum the maximum bandwidth requirements of individual Trunk Groups or Route Patterns to determine their impact on the WAN. If multiple sources of traffic are being sent over the WAN, that activity must be combined at a low level before performing traditional traffic engineering calculations to determine the busy hour requirements. This tool allows you to select the sources of voice traffic that will be carried over a shared facility, and calculate the bandwidth requirements of that combined traffic using the actual data collected during this InfoPlus Traffic Study.

Benefits

The InfoPlus Aggregate Bandwidth Tool allows you to select and combine traffic sources in two ways:

- Usage by Trunk Groups
- Usage by Route Patterns

From the resulting aggregate traffic, Peak and Average bandwidth utilization of a shared facility can be determined. This approach of selecting specific sources and combining their traffic usage before performing the analysis addresses key aspects of engineering bandwidth requirements:

- Accounting for overlapping and non-overlapping usage
- Allowing for fractional contributions from a given traffic source

These features help reduce costs by preventing over-provisioning of network resources when engineering new VoIP trunking deployments, and help to accurately monitor the bandwidth consumed by existing deployments. In addition, the tool allows you to explore multiple 'what if' scenarios by altering the parameters and assumptions of the VoIP trunking environment, and measuring their impact on the required network bandwidth.

With improved accuracy and timeliness of information, engineers and IT professionals will be able to design and monitor the network to meet the voice 'quality of service' standards the organization requires.

Accessing the Tool

You can access the InfoPlus Aggregate Bandwidth Tool for this Traffic Study by either clicking on the preceding link, or returning to the web page from which the report was originally downloaded. Once at the tool, you will find a brief tutorial to get you started, and a set of detailed instructions for the more advanced features.

If you have any questions about using the Aggregate Bandwidth Tool, or require further assistance, please contact us at support@infoplusonline.com

InfoPlus Aggregate Bandwidth Tool

Aggregate Sources

Trunk Groups | Route Patterns

- ☐ 1: OUTSIDE CALL — 100%
- ☐ 3: Public Main — 100%
- ☑ 4: Incoming — 50%
- ☑ 5: Euro TIE — 65%
- ☑ 10: London — 100%
- ☑ 11: Chicago — 100%
- ☐ 14: Backup — 100%

Select multiple sources of voice traffic to aggregate - by Trunk Group or Route Pattern

A percentage of each source may be selected to model usage assumptions

Aggregate Analysis

Peak Bandwidth Engineering:

1. Measured Aggregate Usage:
   Max Busy Hour: 335.5 CCS (Wed 1/13/2010 10-11AM)
   Avg Bouncing Busy Hour: 304.5 CCS

2. Theoretical Peak Concurrent Connections (using Poisson):

Max Busy Hour		Avg. Busy Hour	
P.01	P.10	P.01	P.10
18	14	17	13

Peak and average WAN bandwidth requirements are calculated from measured traffic statistics

3. Calculated Bandwidth Per Call:
   Codec: G.711, 64.0 kbps at 20 ms
   Bandwidth Per Call (with Overhead): 95.20 kbps

4. Theoretical Peak Bandwidth Requirements:

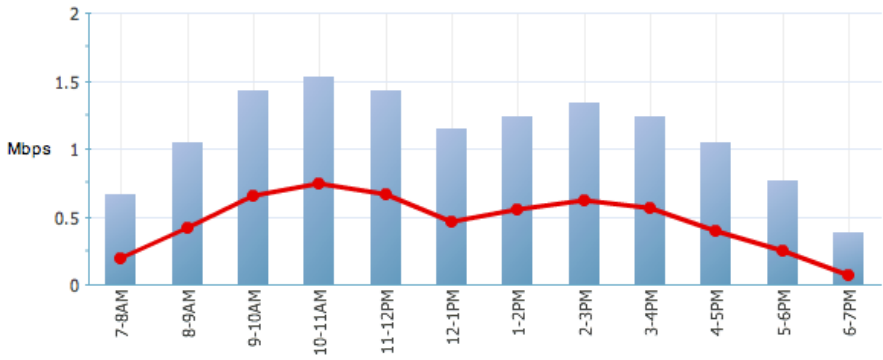| Max Busy Hour Bandwidth		Avg. Busy Hour Bandwidth	
P.01	P.10	P.01	P.10
1.71 Mbps	1.33 Mbps	1.62 Mbps	1.24 Mbps

Average Busy Hour Bandwidth:

1. Average Usage:
   Max Busy Hour: 9.32 Fully Saturated Circuits (Erlangs)
   Avg Bouncing Busy Hour: 8.46 Fully Saturated Circuits (Erlangs)

2. Average Busy Hour Bandwidth:

Max Busy Hour	Avg. Busy Hour
887.08 kbps	805.26 kbps

Daily graph depicts WAN consumption throughout an average day

Average Daily Bandwidth by Hour (Peak vs. Avg):

Explore different VoIP Codec parameters and see their effect on required WAN bandwidth

☑ Select All   Deselect All   ≣ Sort By ▾   🗎 Instructions | 🖶 Print Version

Analysis Criteria

Customer Info

Site Name:
Avaya Communication Manager Demo
Customer #: **12345**

System Type:
Avaya Communications Manager

Timeframe

Start Date:	01/13/2010
End Date:	01/17/2010
Start Hour:	7:00 AM
End Hour:	6:00 PM

Codec

Codec:	G.711 / 64k
Sample Size:	20ms
Net. Overhead:	Ethernet
VAD Enabled:	☐

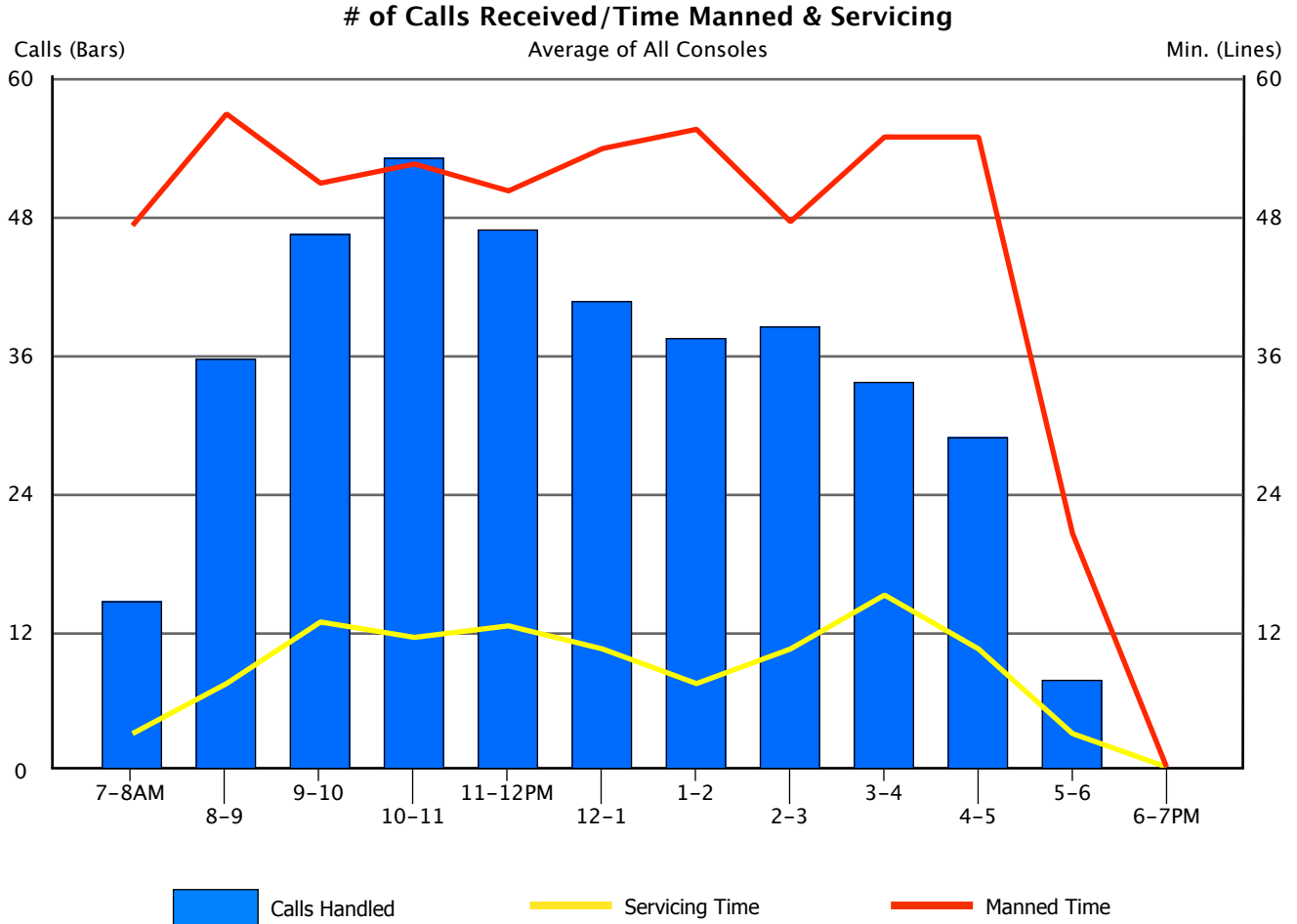**Overall Growth**

-75% —— +100%

Growth: 0%

🔄 Update Analysis

6. Console and Agent 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.
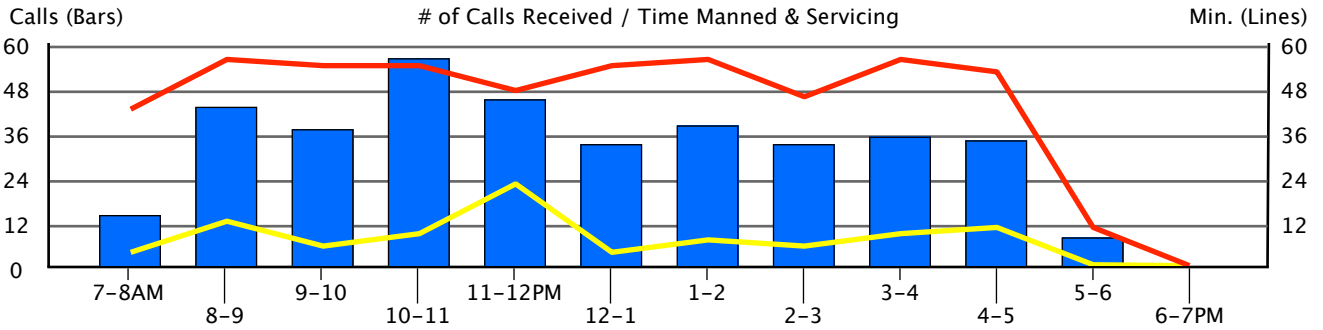
On the following pages, we display the same information for each console per day, using the same conventions noted above.
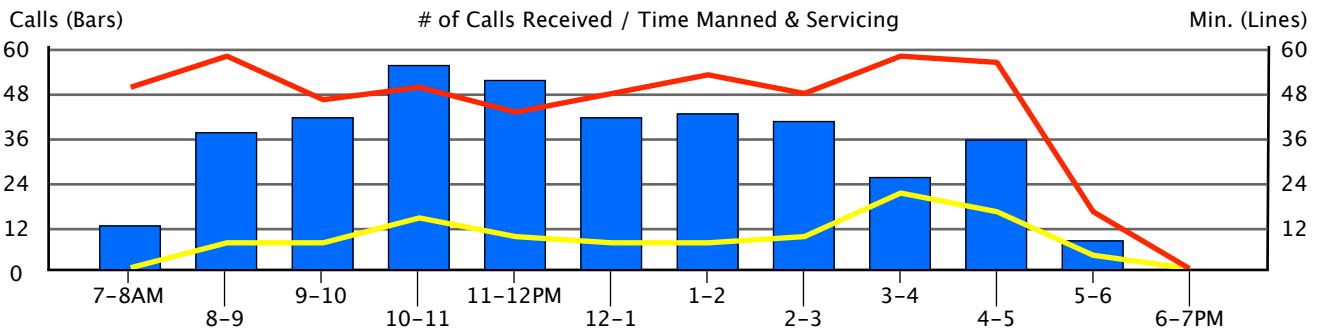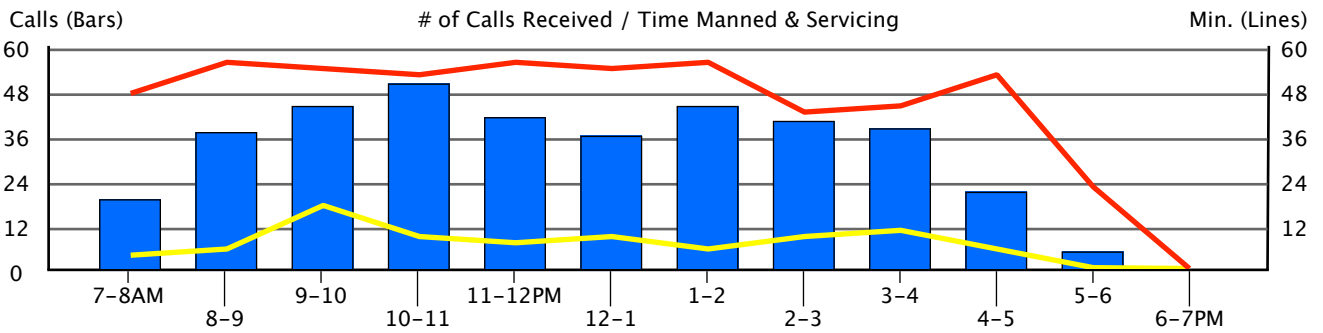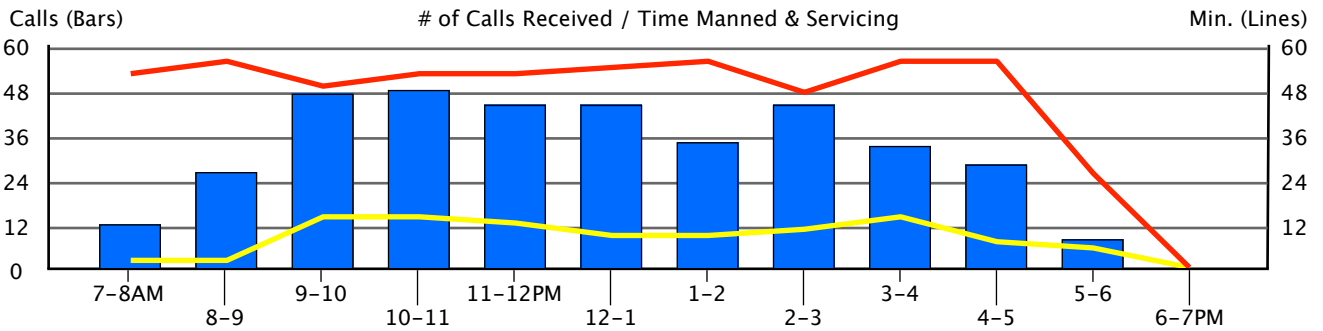
# of Calls Received/Time Manned & Servicing

Average of All Consoles

Calls (Bars)   Min. (Lines)

Legend: Calls Handled | Servicing Time | Manned Time

Calls Handled **Servicing Time** **Manned Time**

Console 1 Thu 1/4/2018

Calls (Bars)   # of Calls Received / Time Manned & Servicing   Min. (Lines)

7–8AM 8–9 9–10 10–11 11–12PM 12–1 1–2 2–3 3–4 4–5 5–6 6–7PM

Console 1 Fri 1/5/2018

Calls (Bars)   # of Calls Received / Time Manned & Servicing   Min. (Lines)

7–8AM 8–9 9–10 10–11 11–12PM 12–1 1–2 2–3 3–4 4–5 5–6 6–7PM

Console 1 Sat 1/6/2018

Calls (Bars)   # of Calls Received / Time Manned & Servicing   Min. (Lines)

7–8AM 8–9 9–10 10–11 11–12PM 12–1 1–2 2–3 3–4 4–5 5–6 6–7PM

Console 1 Sun 1/7/2018

Calls (Bars)   # of Calls Received / Time Manned & Servicing   Min. (Lines)

7–8AM 8–9 9–10 10–11 11–12PM 12–1 1–2 2–3 3–4 4–5 5–6 6–7PM

Console 1 Mon 1/8/2018

Calls (Bars)   # of Calls Received / Time Manned & Servicing   Min. (Lines)

Legend: Calls Handled | Servicing Time | Manned Time

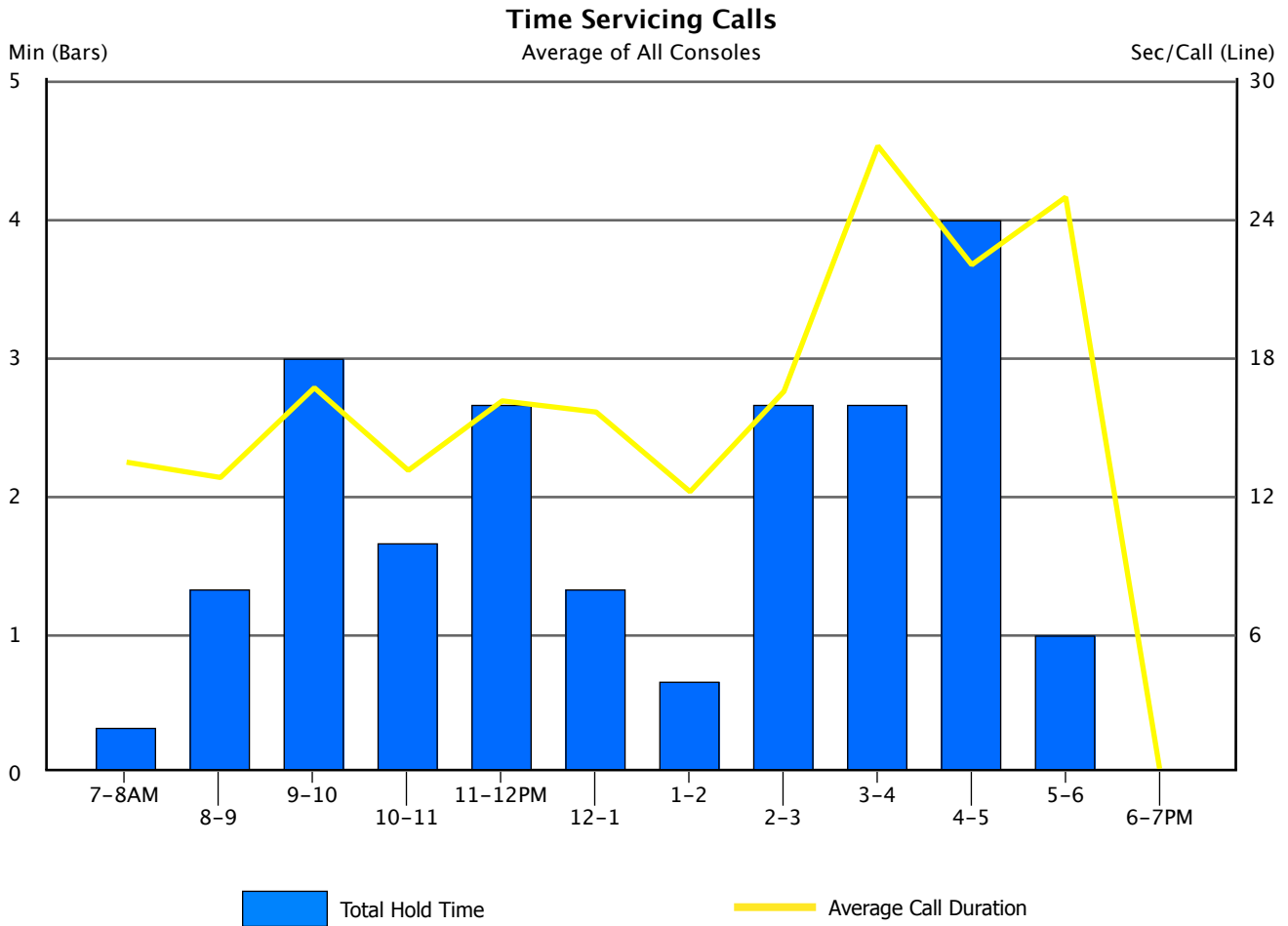X-axis labels: 7-8AM, 8-9, 9-10, 10-11, 11-12PM, 12-1, 1-2, 2-3, 3-4, 4-5, 5-6, 6-7PM
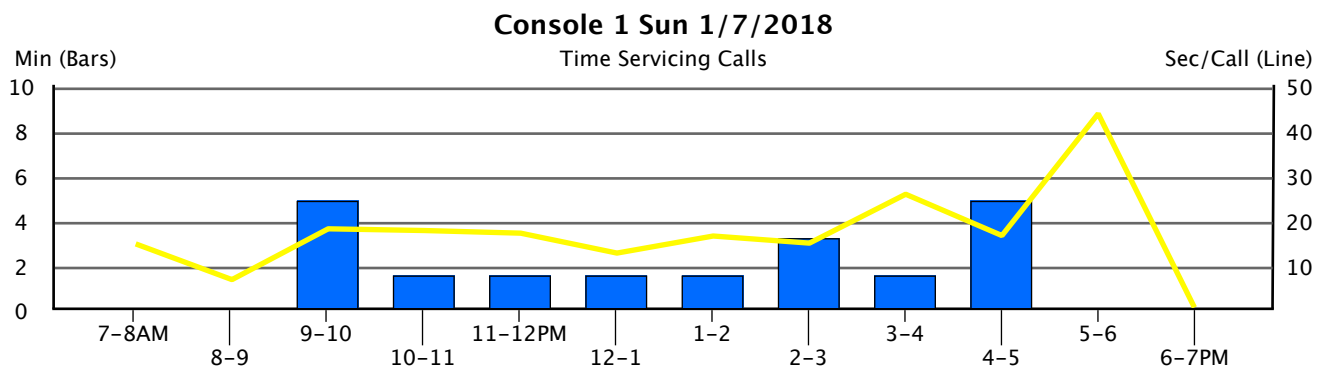
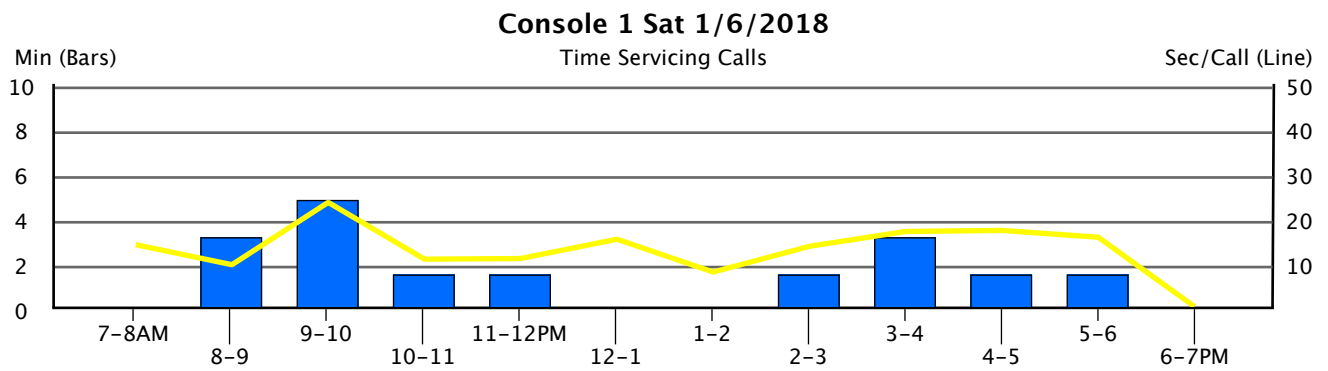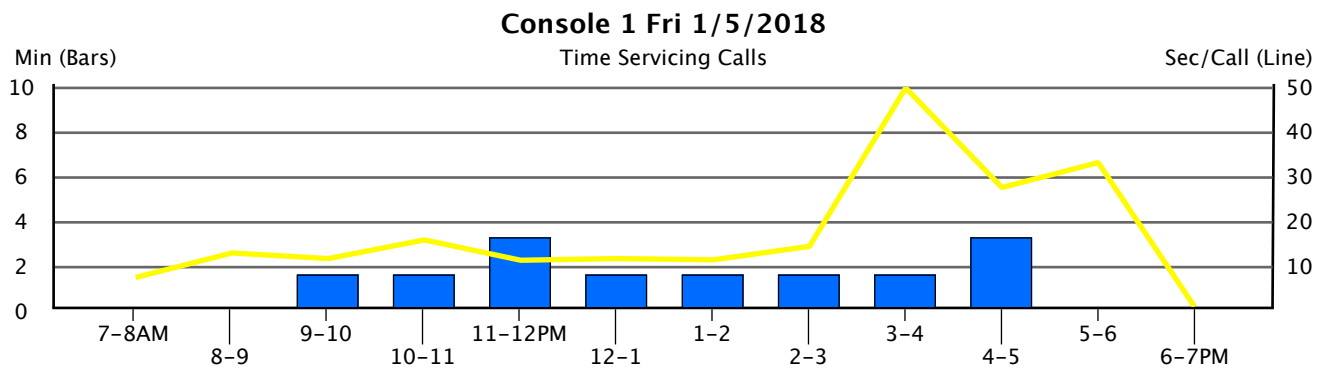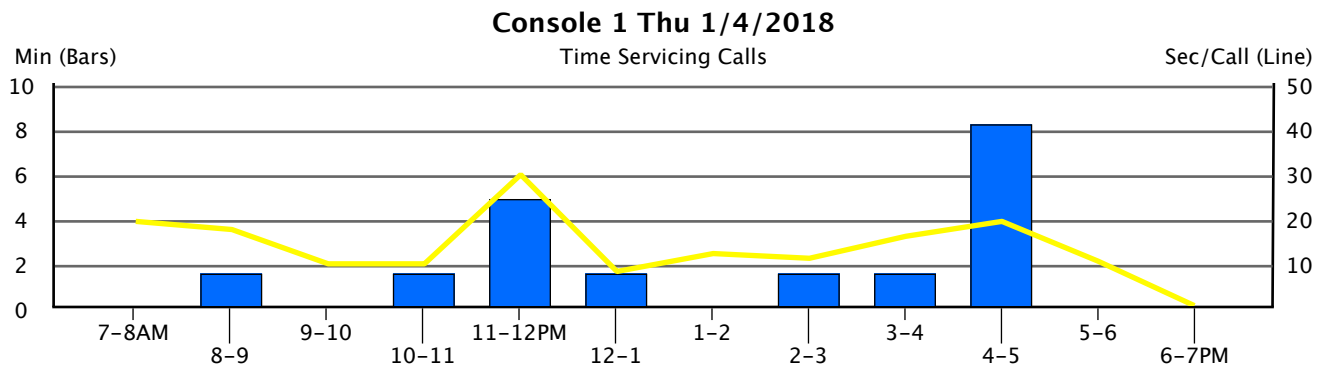# 6.2. Console Time Spent in the Processing of Calls

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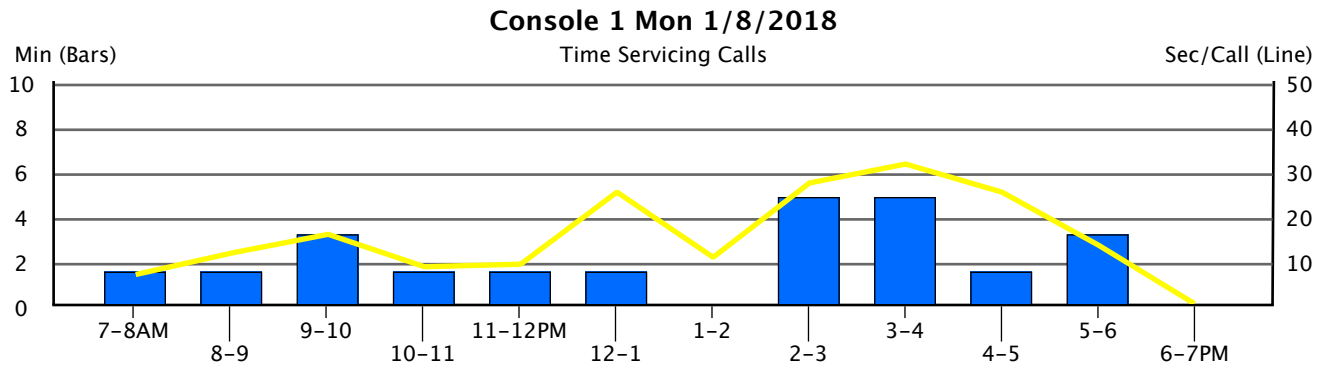
On the following pages, we display the same information for each console per day, using the same conventions noted above.

Time Servicing Calls

Average of All Consoles

Total Hold Time   Average Call Duration

Console 1 Thu 1/4/2018

Min (Bars)   Time Servicing Calls   Sec/Call (Line)

Console 1 Fri 1/5/2018

Min (Bars)   Time Servicing Calls   Sec/Call (Line)

Console 1 Sat 1/6/2018

Min (Bars)   Time Servicing Calls   Sec/Call (Line)

Console 1 Sun 1/7/2018

Min (Bars)   Time Servicing Calls   Sec/Call (Line)

Console 1 Mon 1/8/2018

Min (Bars)   Time Servicing Calls   Sec/Call (Line)

Legend: Total Hold Time (blue bar), Average Call Duration (yellow line)

X-axis: 7–8AM, 8–9, 9–10, 10–11, 11–12PM, 12–1, 1–2, 2–3, 3–4, 4–5, 5–6, 6–7PM

6.3. Maximum Logged-In Agents

Many of the resources of your communications system are not managed as a physical limit, but are instead licensed for use based on your needs. Among these licensed resources are Agents of several different types. An organization which purchases more Agent licenses than necessary, either initially or during an upgrade, could be wasting money. On the other hand, an organization which uses Agents heavily would not want to risk disruption by unexpectedly running short of licenses.

Below we show the maximum number of Agents concurrently logged in during the course of the study, followed by a graph showing the maximum Agent count by hour. The values shown on the graph are not averages, but rather snapshots in time during the hour in which they occurred. Agents are broken down into different categories, including ACD Agents, Advocate Agents, IP Softphone Agents, and SIP EAS Agents, with each given its own color line on the graph.

Compare this data, which represents your current licensing needs, to the number of Agent licenses you presently own or are upgrading, to ensure they are in agreement. If the Maximum Logins shown below is approaching your License Limit, you may wish to purchase additional licenses before you begin to encounter shortages and possible business disruption. On the contrary, if your existing license limits are sufficiently greater than your current needs, you may want to consider reducing the number of licenses you purchase during your next upgrade cycle to save money.

Maximum* Agent Logins by Type

Agent Type	License Limit	Maximum Logins*	% of License	Date	Time
ACD Agents	400	385	96%	Thu 1/4/2018	3-4PM
Advocate Agents	0	0	--	Thu 1/4/2018	7-8AM
IP Softphone Agents	400	215	54%	Thu 1/4/2018	3-4PM

* - Maximum value sampled during hourly data collection. Actual maximums may have been greater.

NOTE: One or more types of Agents had greater than **90%** of the licensed capacity logged-in simultaneously. You may want to license additional capacity if growth is expected.

Maximum Agent Logins by Hour
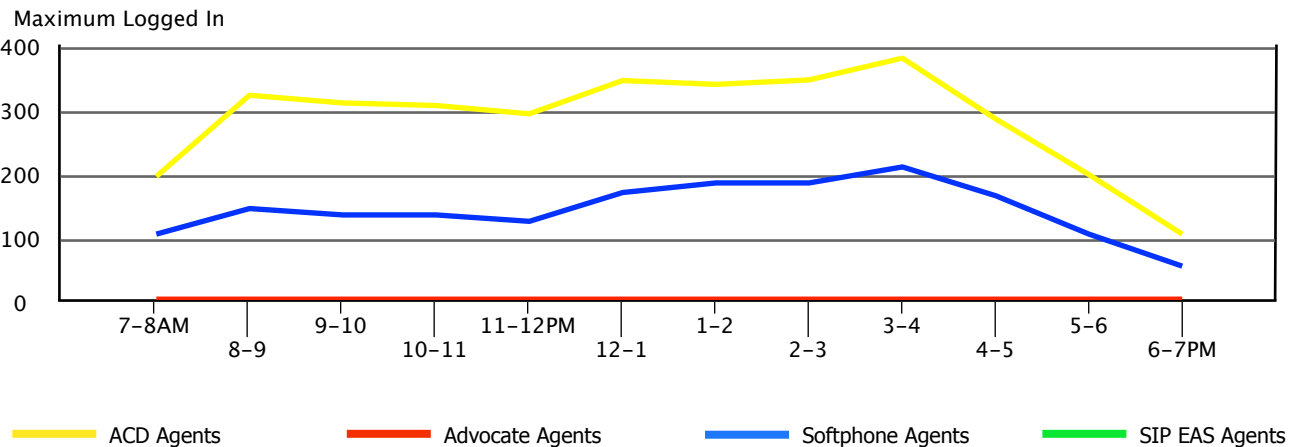
7. Console Performance
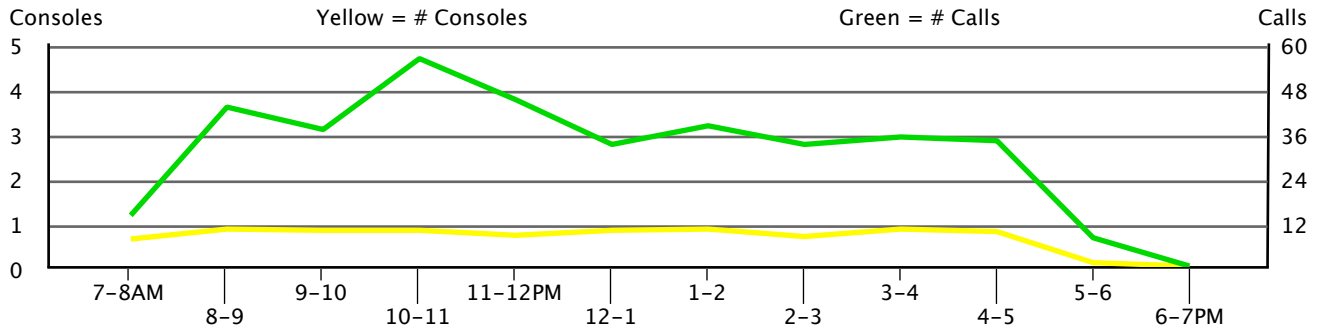
7.1. Overlay Graphs

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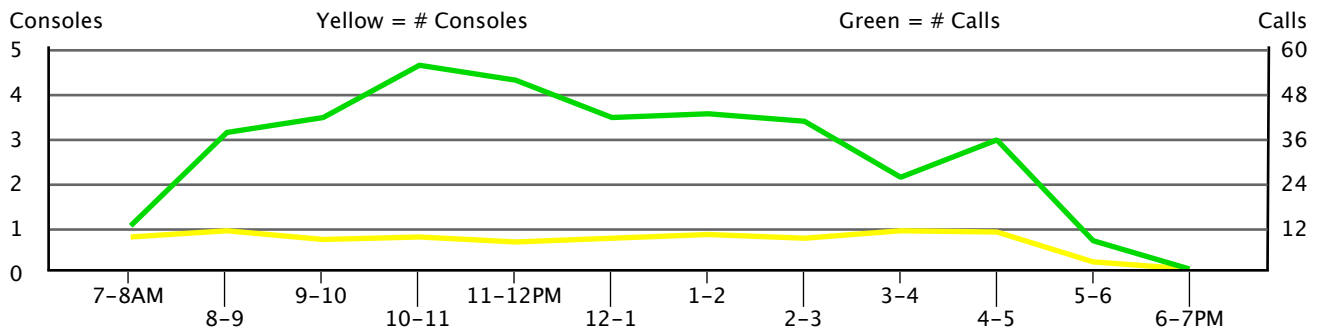
When placed upon a graph of 'Abandoned Calls' for example, (matching the date of the overlay graph with the date of the Abandoned Calls graph) we will be able to see the impact call volume and staffing have on the number of calls which abandoned, and their average wait time. A similar analysis can be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

Thu 1/4/2018

Consoles   Yellow = # Consoles   Green = # Calls   Calls

Fri 1/5/2018

Consoles   Yellow = # Consoles   Green = # Calls   Calls

Sat 1/6/2018

Consoles   Yellow = # Consoles   Green = # Calls   Calls

Sun 1/7/2018

Consoles   Yellow = # Consoles   Green = # Calls   Calls

Mon 1/8/2018

Consoles   Yellow = # Consoles   Green = # Calls   Calls
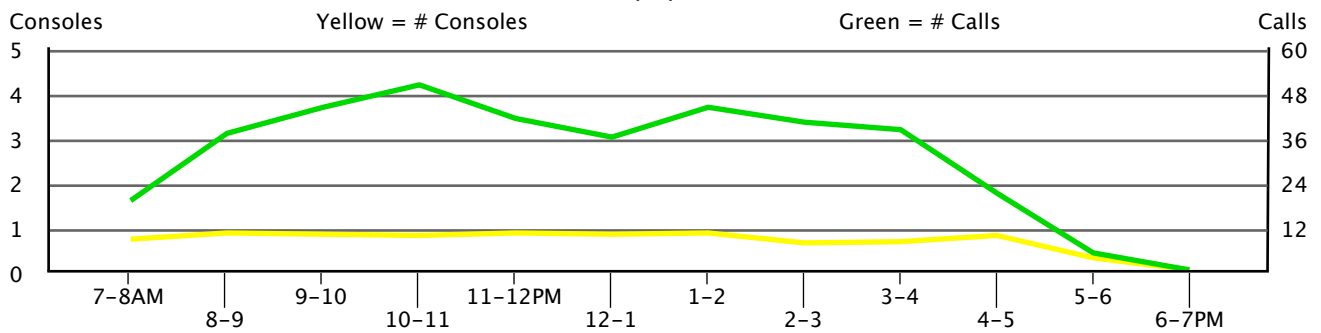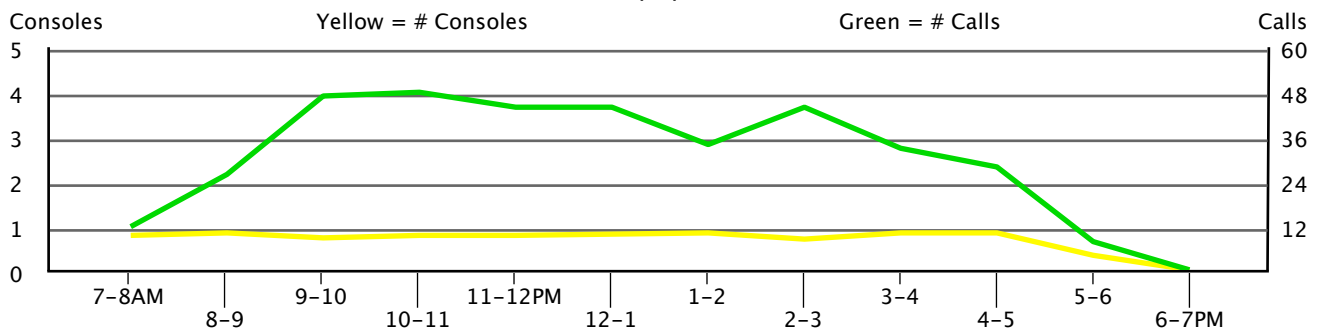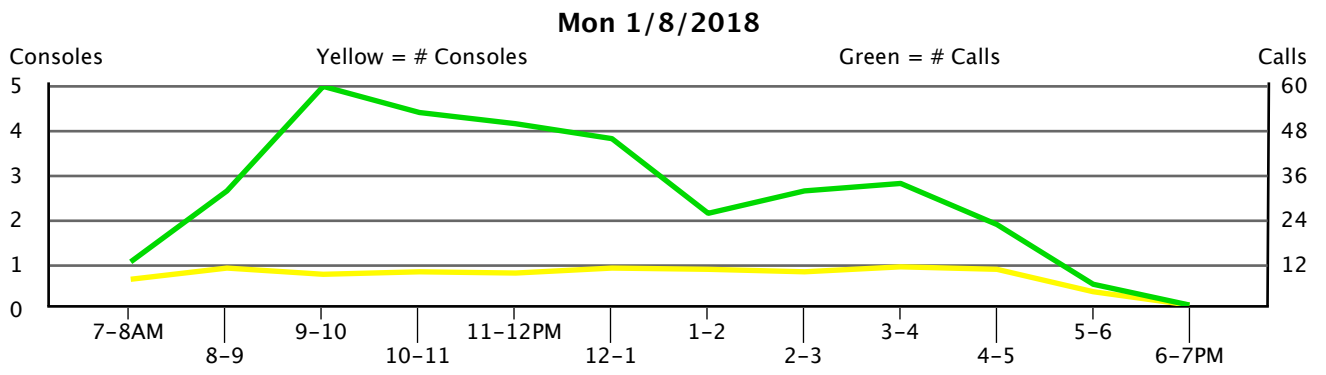
7.2. Delayed Calls (Speed of Answer)

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 ans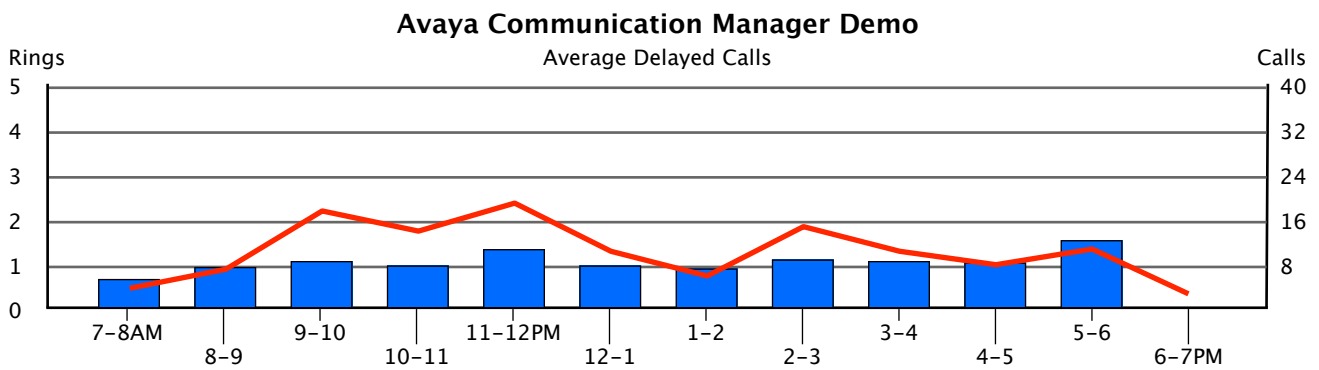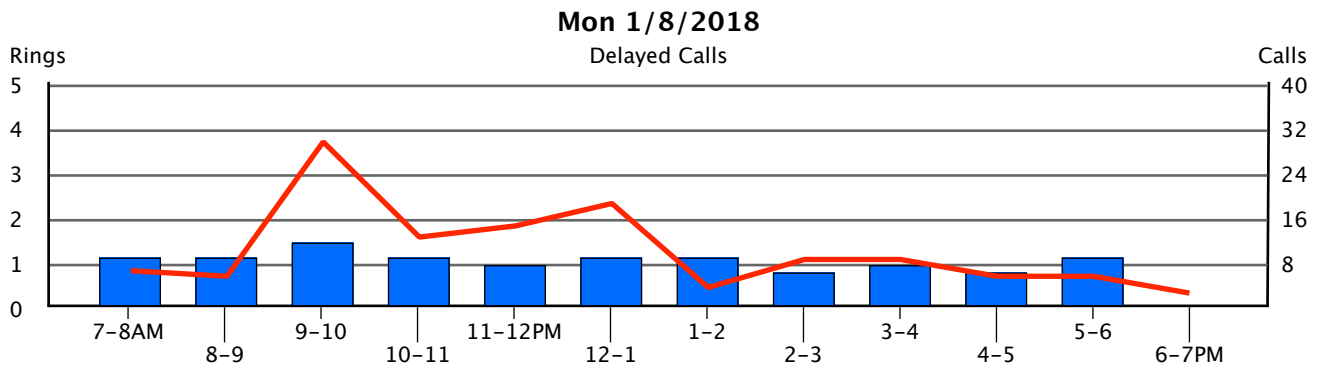wered. Short holding times are usually tolerated, but long holding times will result in poor service and a high number of abandoned calls, reflected in the next report. High queue times may indicate the need to either readjust staffing or add additional attendant positions. Consult Appendix A for established norms, and the 'Console Statistics' section to better gauge overall console performance.

Delay Time   Calls Delayed

Sat 1/6/2018

Rings   Delayed Calls   Calls

Sun 1/7/2018

Rings   Delayed Calls   Calls

Mon 1/8/2018

Rings   Delayed Calls   Calls
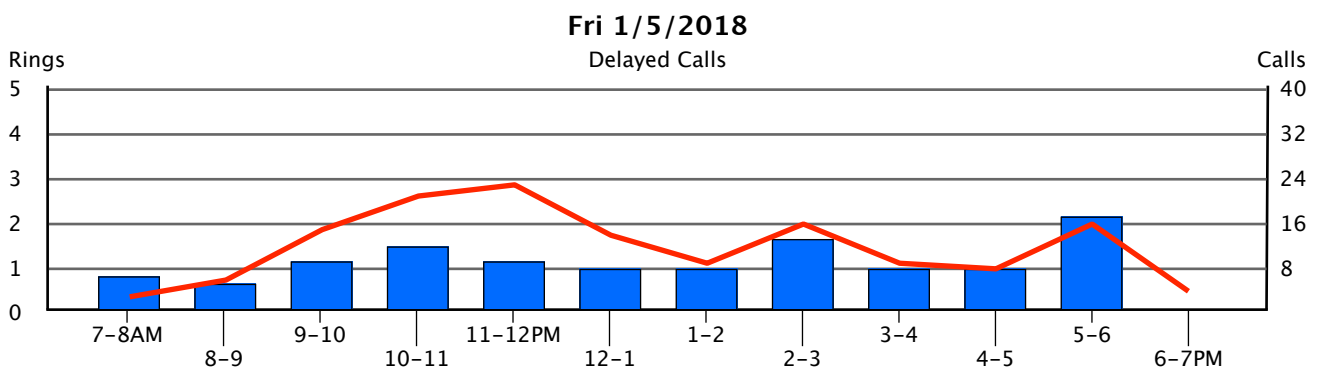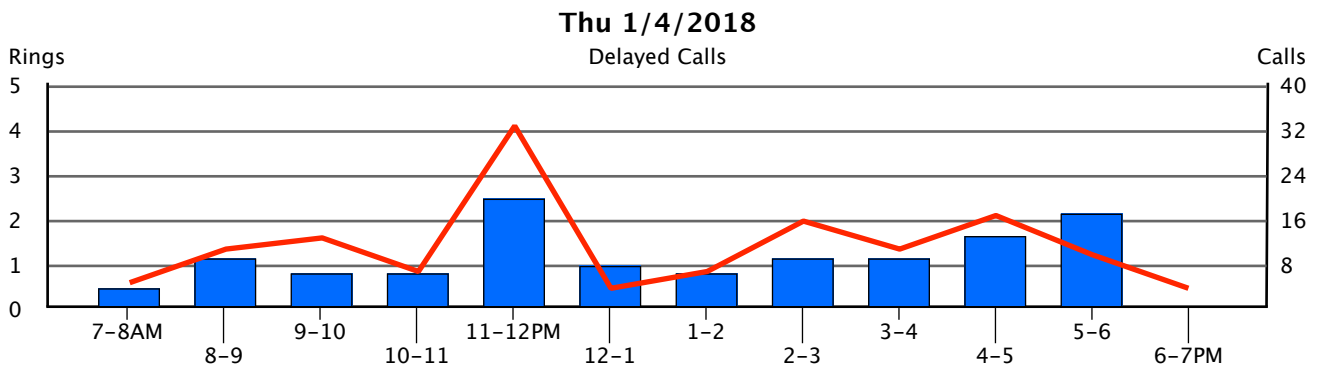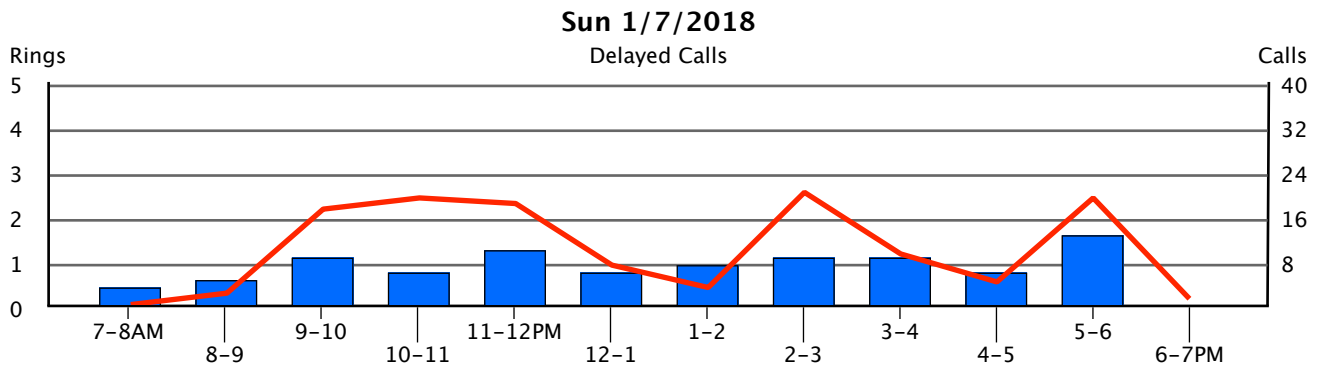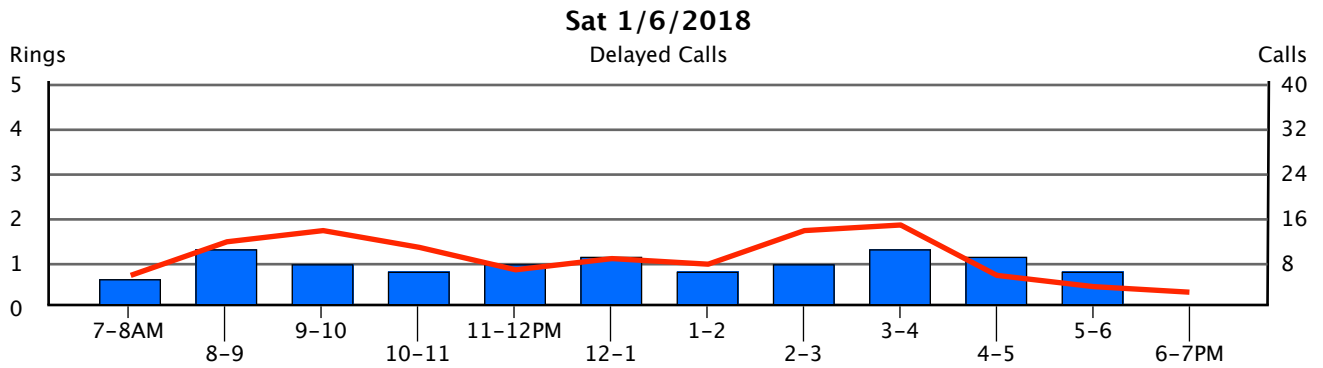
7.3. Abandoned Calls

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.

Avaya Communication Manager Demo
Average Abandoned Calls

Thu 1/4/2018
Abandoned Calls

Fri 1/5/2018
Abandoned Calls

Wait Time   Calls Abandoned
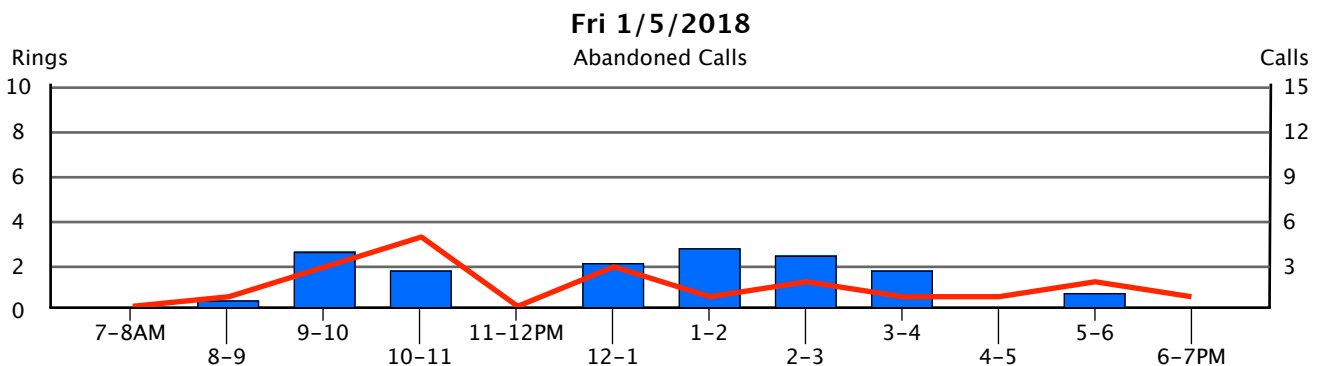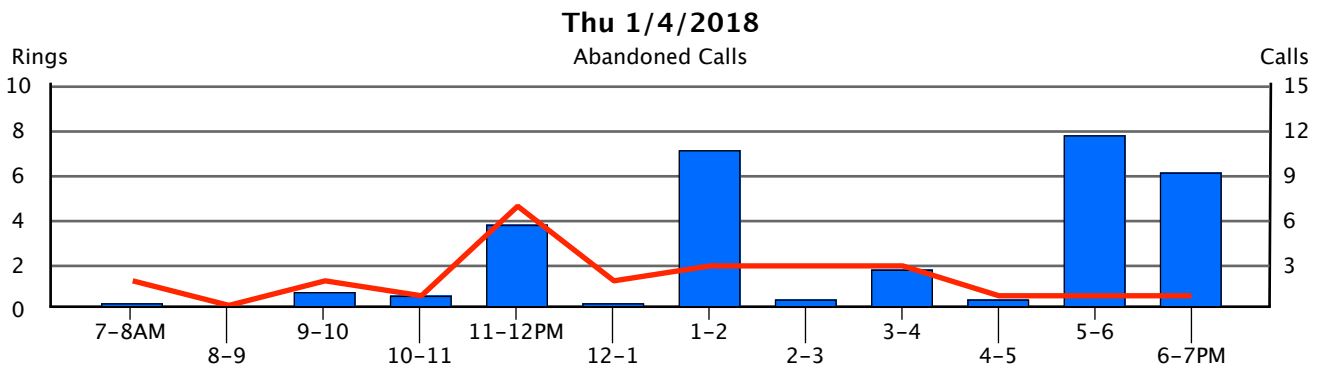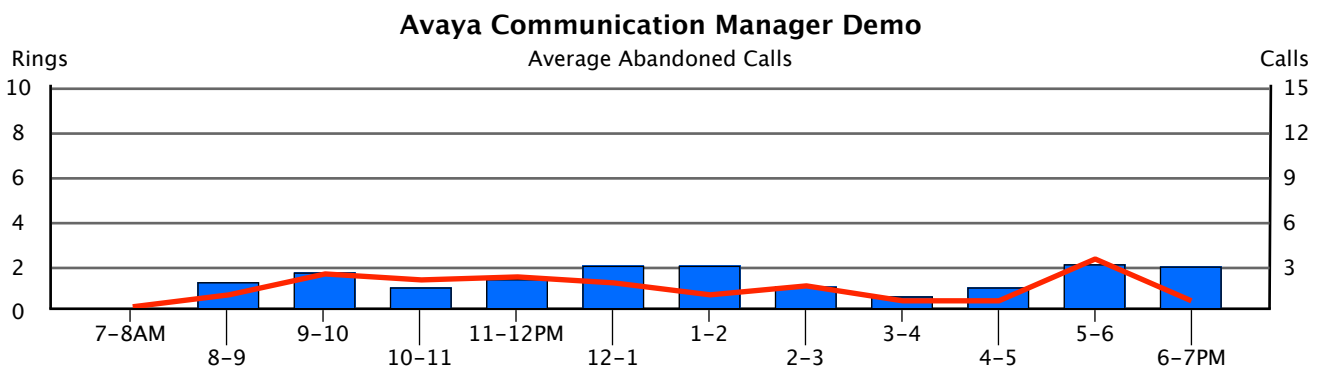
Sat 1/6/2018
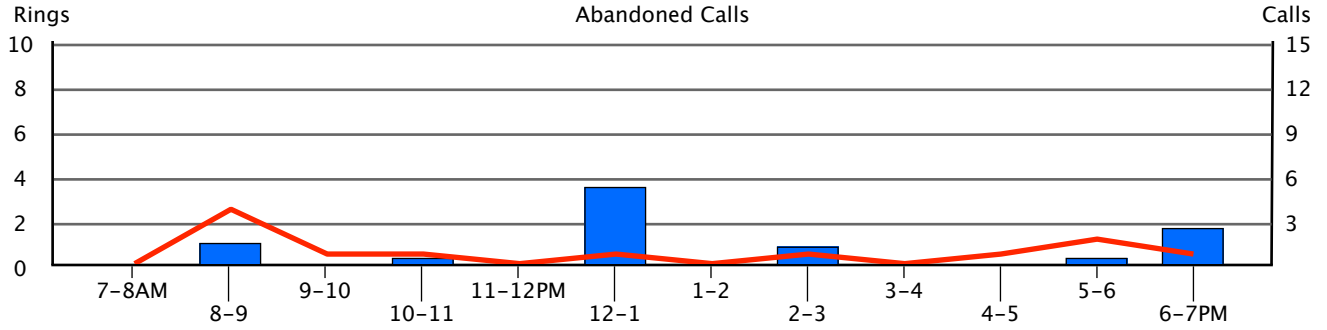
Abandoned Calls

Sun 1/7/2018

Abandoned Calls

Mon 1/8/2018

Abandoned Calls

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.

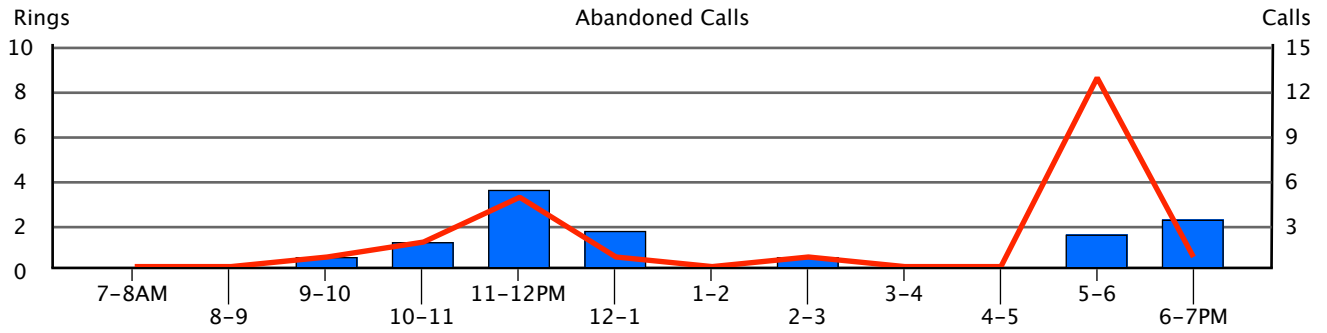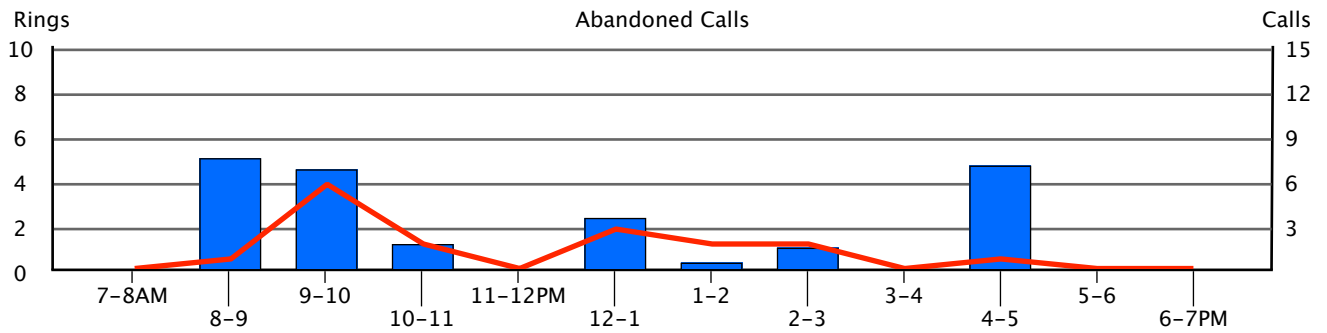| Date	Time	Total Calls Offered	# Calls Answered	Avg Speed of Answer (sec.)	# Calls Delayed	% Calls Delayed	# Calls Abnd.	% Calls Abnd.	Avg Wait (sec.)
Thu 1/4/18	7-8AM	17	15	3	5	29.4	2	11.8	2
Thu 1/4/18	8-9AM	44	44	7	11	25.0	0	0.0	0
Thu 1/4/18	9-10AM	40	38	5	13	32.5	2	5.0	5
Thu 1/4/18	10-11AM	58	57	5	7	12.1	1	1.7	4
Thu 1/4/18	11AM-12PM	53	46	15	33	62.3	7	13.2	23
Thu 1/4/18	12PM-1PM	36	34	6	4	11.1	2	5.6	2
Thu 1/4/18	1-2PM	42	39	5	7	16.7	3	7.1	43
Thu 1/4/18	2-3PM	37	34	7	16	43.2	3	8.1	3
Thu 1/4/18	3-4PM	39	36	7	11	28.2	3	7.7	11
Thu 1/4/18	4-5PM	36	35	10	17	47.2	1	2.8	3
Thu 1/4/18	5-6PM	10	9	13	10	100.0	1	10.0	47
Thu 1/4/18	6-7PM	4	3	0	4	100.0	1	25.0	37
Daily Totals		**416**	**390**	**7.4**	**138**	**33.2**	**26**	**6.2**	**17.0**
Fri 1/5/18	7-8AM	13	13	5	3	23.1	0	0.0	0
Fri 1/5/18	8-9AM	39	38	4	6	15.4	1	2.6	3
Fri 1/5/18	9-10AM	45	42	7	15	33.3	3	6.7	16
Fri 1/5/18	10-11AM	61	56	9	21	34.4	5	8.2	11
Fri 1/5/18	11AM-12PM	52	52	7	23	44.2	0	0.0	0
Fri 1/5/18	12PM-1PM	45	42	6	14	31.1	3	6.7	13
Fri 1/5/18	1-2PM	44	43	6	9	20.5	1	2.3	17
Fri 1/5/18	2-3PM	43	41	10	16	37.2	2	4.7	15
Fri 1/5/18	3-4PM	27	26	6	9	33.3	1	3.7	11
Fri 1/5/18	4-5PM	37	36	6	8	21.6	1	2.7	1
Fri 1/5/18	5-6PM	16	14	13	16	100.0	2	12.5	5
Fri 1/5/18	6-7PM	7	6	0	4	57.1	1	14.3	0
Daily Totals		**429**	**409**	**7.0**	**144**	**33.6**	**20**	**4.7**	**10.7**
Sat 1/6/18	7-8AM	20	20	4	6	30.0	0	0.0	0
Sat 1/6/18	8-9AM	42	38	8	12	28.6	4	9.5	7
Sat 1/6/18	9-10AM	46	45	6	14	30.4	1	2.2	1
Sat 1/6/18	10-11AM	52	51	5	11	21.2	1	1.9	3

Date	Time	Total Calls Offered	# Calls Answered	Avg Speed of Answer (sec.)	# Calls Delayed	% Calls Delayed	# Calls Abnd.	% Calls Abnd.	Avg Wait (sec.)
Sat 1/6/18	11AM-12PM	42	42	6	7	16.7	0	0.0	0
Sat 1/6/18	12PM-1PM	38	37	7	9	23.7	1	2.6	22
Sat 1/6/18	1-2PM	45	45	5	8	17.8	0	0.0	0
Sat 1/6/18	2-3PM	42	41	6	14	33.3	1	2.4	6
Sat 1/6/18	3-4PM	39	39	8	15	38.5	0	0.0	0
Sat 1/6/18	4-5PM	23	22	7	6	26.1	1	4.3	1
Sat 1/6/18	5-6PM	8	6	5	4	50.0	2	25.0	3
Sat 1/6/18	6-7PM	4	3	0	3	75.0	1	25.0	11
Daily Totals		**401**	**389**	**6.1**	**109**	**27.2**	**12**	**3.0**	**6.5**
Sun 1/7/18	7-8AM	13	13	3	0	0.0	0	0.0	0
Sun 1/7/18	8-9AM	27	27	4	3	11.1	0	0.0	0
Sun 1/7/18	9-10AM	49	48	7	18	36.7	1	2.0	4
Sun 1/7/18	10-11AM	51	49	5	20	39.2	2	3.9	8
Sun 1/7/18	11AM-12PM	50	45	8	19	38.0	5	10.0	22
Sun 1/7/18	12PM-1PM	46	45	5	8	17.4	1	2.2	11
Sun 1/7/18	1-2PM	35	35	6	4	11.4	0	0.0	0
Sun 1/7/18	2-3PM	46	45	7	21	45.7	1	2.2	4
Sun 1/7/18	3-4PM	34	34	7	10	29.4	0	0.0	0
Sun 1/7/18	4-5PM	29	29	5	5	17.2	0	0.0	0
Sun 1/7/18	5-6PM	22	9	10	20	90.9	13	59.1	10
Sun 1/7/18	6-7PM	3	2	0	2	66.7	1	33.3	14
Daily Totals		**405**	**381**	**6.1**	**130**	**32.1**	**24**	**5.9**	**12.0**
Mon 1/8/18	7-8AM	13	13	7	7	53.8	0	0.0	0
Mon 1/8/18	8-9AM	33	32	7	6	18.2	1	3.0	31
Mon 1/8/18	9-10AM	66	60	9	30	45.5	6	9.1	28
Mon 1/8/18	10-11AM	55	53	7	13	23.6	2	3.6	8
Mon 1/8/18	11AM-12PM	50	50	6	15	30.0	0	0.0	0
Mon 1/8/18	12PM-1PM	49	46	7	19	38.8	3	6.1	15
Mon 1/8/18	1-2PM	28	26	7	4	14.3	2	7.1	3
Mon 1/8/18	2-3PM	34	32	5	9	26.5	2	5.9	7
Mon 1/8/18	3-4PM	34	34	6	9	26.5	0	0.0	0
Mon 1/8/18	4-5PM	24	23	5	6	25.0	1	4.2	29
Mon 1/8/18	5-6PM	7	7	7	6	85.7	0	0.0	0
Mon 1/8/18	6-7PM	0	0	0	3	--	0	--	0
Daily Totals		**393**	**376**	**6.8**	**127**	**32.3**	**17**	**4.3**	**18.2**

8. Summary

8.1. Action Items

Following is a summary of issues raised during the processing of this Traffic Study which you may want to take action on. The details of each item and supporting information may be found in the corresponding section of the report. Please note that several of these Action Items are based on standard recommendations and may not be suitable or appropriate for your unique telecommunications environment. Addressing these issues now will lead to better service, fewer user complaints, a better utilization of system resources, and an easier system to manage.

Annual Traffic Studies will help ensure continued good service by performing these evaluations on a regular basis.

Dial Tone Delay

There were a total of **2** distinct hours during the study period in which delays or denials for Dial Tone were encountered. You may want to consider adding Tone Receiver cards to your system to eliminate this condition.

See Section 3.2, "Tone Receivers" for additional details.

Non-Working Trunks

The following Trunk Groups contain Trunks which are Equipped, but not Working: **1**

If this is a permanent condition, you may be incurring excess cost to cover these non-working Trunks. Consider disconnecting and removing the definition of these Trunks to reduce costs if you do not intend to put them back in service.

See Section 5.1, "Trunk Group Traffic" for additional details.

IP Region Denied Pegs

The following IP Regions experienced denied pegs during their busiest hours: **1**

You should consider adding additional DSP resources, or rebalancing existing resources to prevent blockages.

See Section 4.1, "IP Network Region Traffic" for additional details.

CLAN Socket Load

1 CLAN Boards have experienced denials and/or busy conditions during the study period. It may be necessary to add additional CLAN boards to prevent future service interruptions.

See Section 4.2, "CLAN Socket Registration" for additional details.

Insufficient Console Manned Time

100% of the hours during the study collection period did not have at least one console manned for the entire hour. In an attempt to derive the intended business hours of your organization, this analysis only includes hours strictly between the first and last hour of each day that a console was manned. You may want to adjust attendant staffing to ensure continuous console coverage during business hours.

See Section 7.4, "Console Statistics" for additional details.

High Console Abandoned Calls Percentage

There were **18** distinct, manned hours during the study collection period in which the percentage of console calls abandoned exceeded a conservative recommendation of 5%. You may want to consider increasing console coverage during business hours and/or verifying consoles have appropriate night service coverage during non-business hours to ensure the percentage of calls abandoned remains low.

See Section 7.4, "Console Statistics" for additional details.

High Console Queue Delay Percentage

31% of the manned console hours during the study collection period had more than 35% of console calls delayed. You may want to consider additional console coverage during peak hours to ensure the percentage of calls delayed remains low.

See Section 7.4, "Console Statistics" for additional details.

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 Manned	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. Access to this information is via a password protected login which provides a list of all InfoPlus reports archived for the 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

Upon completion of this report, authorized users will receive a notification email with instructions on how to log in to their account. Depending on the level of access you're granted, you will be able to view and download reports for this system only, or use an enhanced interface for analyzing and downloading reports from multiple systems you manage. Once logged in, you will be presented with a list of all available InfoPlus reports for each system, along with the date each report was run. Select the report you wish to view, and it will either be presented directly in your browser window, downloaded to your computer, or displayed within a new Adobe Reader window. Use the navigation bar to flip through the report page by page, or use the bookmarks on the left to access a particular section.

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.

Bandwidth

The rate at which successive packets of data can be transmitted over an IP network. Bandwidth is measured in kbps (thousands of bits per second), Mbps (millions of bits per second), or Gbps (billions of bits per second).

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 Communication Server 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 Communication Server, including call duration, destination number, date and time, etc.

Codec

An algorithm that encodes and decodes a data stream for transmission over a network or storage to persistent media. In the encoding and decoding process, data compression/decompression techniques can be applied to reduce the apparent amount of data transported by the network or stored.

CRC

Abbreviation for Cyclic Redundancy Check. A CRC is an extra piece of data transmitted along with regular data which serves to detect transmission errors. It is derived from a mathematical formula based on the composition of the data which it safeguards, allowing the recipient to easily validate the data received.

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 (Internet Protocol)

A widely adopted protocol for transmitting data across a packet switched network, including the Internet.

IP Network Region

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

LAN (Local Area Network)

A network that is internal to your organization. A LAN is viewed as a private resource with restricted access.

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.

Poisson

A probability formula used for determining trunking requirements for Trunk Groups in which excess calls may be queued, but maximum holding times are fixed.

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.

Silence Suppression

When encoding voice communications into IP packets, silence is not encoded and transmitted as part of the voice traffic data. This reduces the overall bandwidth requirements on an IP network, and is an optional feature that may be enabled. Silence Suppression is also referred to as VAD (Voice Activity Detection).

SourceBook

A documentation of the assignments and configuration of a Communication Server, 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 Communication Server, which handle touch tones and call progress tones.

Trunk

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

Trunk Group

Trunks of similar nature and purpose defined in the system.

VAD (Voice Activity Detection)

When encoding voice communications into IP packets, silence is not encoded and transmitted as part of the voice traffic data. This reduces the overall bandwidth requirements on an IP network, and is an optional feature that may be enabled. VAD is also referred to as Silence Suppression.

VoIP (Voice over IP)

The transmission of voice communications over IP networks. Speech is encoded into IP packets using a codec, and transmitted over an IP network instead of a conventional, dedicated telecommunications network. The IP network may simultaneously be carrying non-voice data as well, resulting in a Converged Network.

WAN (Wide Area Network)

A network covering a broad geographical area. A WAN is typically viewed as a network that is external to your organization, and may be public or private.