vmware | virtual infrastructure METHODOLOGY

VMware Capacity Planner Results

Assessment Report

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FDCCD

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Section Contents

Section 1: Executive Summary

FDCCD is considering making an investment in VMware virtual infrastructure. FDCCD engaged VMware to conduct a virtualization assessment to provide guidance in deciding whether or not virtualization aligns with operational and financial objectives.

The assessment analyzed system characteristics and utilization metrics to determine how well existing workloads can be virtualized. The assessment also gathered FDCCD-specific financial data to approximate the associated costs of virtualization.

VMware is pleased to present this report which documents the findings of the assessment. This report is intended to help determine the following items:

- Assess the opportunity for system virtualization
- Estimate the costs to deploy a standard virtualization solution, along with potential cost savings
- Assess the level of fit between FDCCD and that solution
- Provide a roadmap of next steps

The conclusion of this assessment is that a virtualization strategy is a worthwhile pursuit by FDCCD. It is anticipated that virtualization will help FDCCD consolidate a considerable number of existing and expected future workloads, thereby increasing average system utilization and lowering the overall hardware footprint and associated costs.

1.1 VMware Capacity Planner

This report is generated, using a VMware product called Capacity Planner. VMware Capacity Planner is available to partners to provide quick and accurate virtualization analysis for end customers. The report generated is a plan based on the customer's specific environment and goes beyond the results that an interview process can provide.

VMware Capacity Planner Collector gathers inventory and performance data that is sent to the Information Warehouse, analyzed by the Data Analyzer, and presented by VMware.

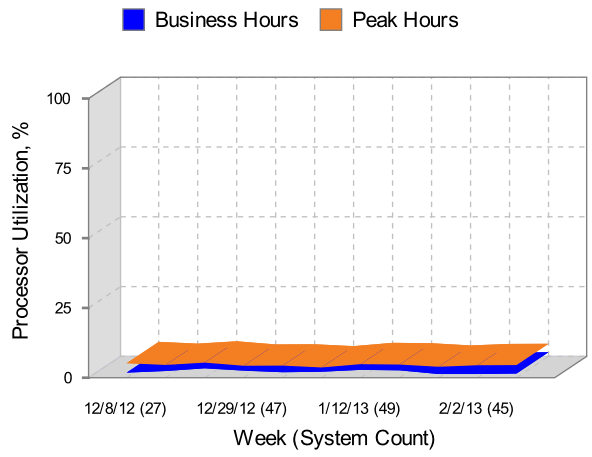
The information collected from your environment for analysis includes:

- Hardware and software inventory to provide capacity and system purpose
- Hardware resource utilization
- Application specific utilization

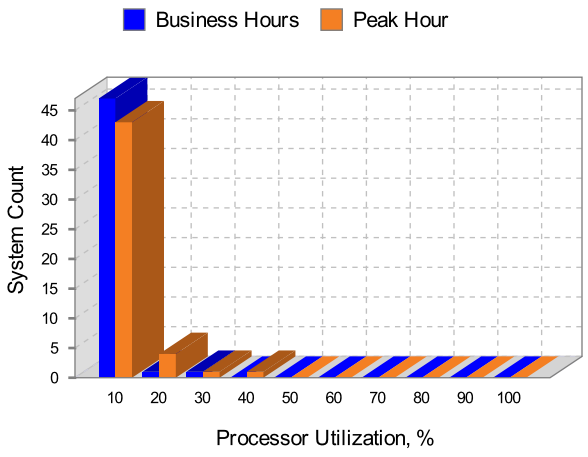
1.2 Summary of Environment

FDCCD's environment was monitored for 10 weeks. The data shows a significant underutilization of current capacity with opportunities to save money using virtualization. The graphs below show the processor utilization trend over the duration of the assessment and the distribution of processor utilization.

Processor Utilization



System Distribution by Processor Utilization



System Count

CPU(s)	Systems
1	4
2	16
4	15
8	13
16	4
Total Systems	52

Processor Summary

CPU MHz	657,372
Avg CPU Utilization	1.61
Peak CPU Utilization	3.34
CPUs	254
Avg MHz/CPU	2,588
Avg MHz/System	13,416

1.3 Assessment Summary Results

The assessment includes two scenarios. Each scenario is created to show the potential consolidation by using different rules. The scenario rules are described in detail in later sections.

One scenario provided the best results. This was determined using the lowest number of systems required. If you have other goals, a different scenario can be used.

Total power, cooling, and space requirements are possible alternative goals. The analysis engine cannot always determine the total power, cooling, and space requirements of reused systems. Examine the table carefully to determine if existing systems have enough chassis information to be included in the table.

1.3.1 Scenario Comparison

This assessment included two analysis scenarios. This report will expand on the highlighted scenarios. The highlighted scenario has been chosen as the optimum path for FDCCD. It has the desired qualities for a successful virtualization plan.

Scenario Name	Systems Analyzed	ESX Hosts Required	System Exceptions	Overall Consolidation Ratio %	Total Storage Required (TB)	Rack Used	KW Used	Tons BTU/hr Used
Moderate	49	4	0	92	0.000	8.0	2.28	0.65
Aggressive	49	2	0	96	0.000	4.0	1.14	0.32

1.3.2 Selected Scenario Results

The optimum scenario selected was Aggressive. The results of this scenario are:

- 49 systems were analyzed.
- 2 ESX servers were needed to host 49 systems.
- 0 systems had resource requirements beyond what the chosen scenario rules or hardware platform could provide.
- The consolidation ratio for eligible systems is 49 to 2, a 96% decrease in systems.
- The consolidation ratio including all systems is 49 to 2, a 96% decrease in total systems.

1.3.3 Selected ESX Host Platform

The scenario Aggressive used the following platform as the target platform for virtualization:

Make: Dell

Model: PowerEdge R710

Hardware Component	Number	Size, Speed
CPUs	12	2530 MHz
RAM		196608 MB
Network Interface Cards	2	10000 MB/sec
Disk I/O		999999999 MB/sec
Disk Storage		400 GB

The total storage required by the scenario is not based on disk storage of individual hosts.

1.4 Next Steps

This report is the beginning of the consolidation project. VMware Capacity Planner provides an initial plan for the following items:

- The number of ESX hosts of the chosen configuration that are needed to start a virtualization project
- The optimal placement of systems to ESX hosts

- Expected ESX host and based on a 4-week average
- Recommendation for minimizing virtual machine base image counts and maximizing the licenses in the images
- Recommendation for virtual machine template sizing

Environments change rapidly. The validity of this assessment diminishes over time. The initial recommendation is good for project budgeting. If this is your first assessment, it is a good idea to take the following actions:

- Validate this consolidation estimate with your technology team
- Adjust the consolidation analysis to improve the consolidation ratio
- Leverage these results to build a business case with financial analysis

After your initial assessment and planning, you should repeat assessments as needed to monitor the change of the environment and adjust the plans as the environment changes.

1.4.1 Plan and Build Virtual Infrastructure

VMware recommends that you perform the following actions in addition to using VMware Capacity Planner for designing a Virtual Infrastructure.

- Assemble an architecture team with key subject matter experts and stakeholders
- Conduct a gap analysis to review specific requirements relative to the assumptions made in this report to develop detailed specifications
  - Perform VIM assessment (augment the findings in this virtualization assessment report)
- Plan and design virtual infrastructure
  - VIM Project Plan
    - Develop a project plan for deployment - VIM Project Plan
    - Develop detailed design and assembly procedures - VIM Blueprints
    - Develop an implementation test plan - VIM Test Plan
    - Develop a plan for managing virtual infrastructure - VIM Management Plan
- Arrange VI Jumpstart workshops to involve the FDCCD team in the design process
  - VMware Infrastructure with P2V Jumpstart workshop
    - Develop a prototype
    - Conduct a proof of concept system migration
    - Use Business Continuity to explore high availability, backups and disaster recovery options with respect to VMware Infrastructure
- Develop and document procedures for migrating systems and provisioning new systems
- Train owners. Suggest VMware Infrastructure classes
- Implement virtual infrastructure and migrate systems
  - VIM Build Project
- Manage Virtual Infrastructure
  - Virtual Infrastructure Health Check

Section 2: Analysis Results

Each scenario that was used for this report has options to control the analysis. This section details the options for each of the scenarios. The optimal scenario results are shown in Section 2.1.

2.1 Scenario 1: Aggressive

2.1.1 Scenario Results Summary

The following tables show the summary results for this scenario. Each scenario has different rules for analysis. The rules can affect any of the numbers in the tables. These numbers are specific to this scenario and can be compared to other scenarios to determine the optimum configuration.

Systems Analyzed	ESX Hosts Required	System Exceptions	Overall Consolidation Ratio %	Total Storage Required (TB)	Rack Used	KW Used	Tons BTU/hr Used
49	2	0	96	0.000	4.0	1.14	0.32

2.1.1.1 Hardware Capacity and Environment Summary

The following table shows the capacity and environment requirements for the hardware chosen and the number of systems needed to support the analyzed systems. A reduction in capacity and data center environment effect is usually realized.

VMware Capacity Planner uses the name plate rating to determine the environmental requirements. Capacity Planner does not always have the environment specifications for the input systems. In the case where information is missing, the results show an increase in environment requirements when it is not the case.

	Capacity								
	Processors	Memory	Disk	Network		Physical			
	Speed (GHz)	Size (GB)	Size (TB)	Count	Speed (Gb/sec)	Rack Units	Weight (lbs)	Power (KW)	Thermal (Tons BTU/hr)
Before Analysis	459.81	491.40	354.08	110	106.40	60.0	1,788.00	21.89	5.175
New System Totals	36.31	384.00	0.80	4	40.00	4.0	96.00	1.14	0.324
After Analysis	36.31	384.00	0.80	4	40.00	4.0	96.00	1.14	0.324
Systems Savings	423.50	107.40	353.28	106	66.40	56.0	1,692.00	20.75	4.851

After analysis disk size is a sum of individual host disk capacities. It might be surpassed by the actual disk utilization after consolidation.

2.1.1.2 Resource Utilization Summary

The analysis engine estimates utilization based on the new hardware selection, analysis rules, and capacity totals. This summary is unique to this scenario.

	Estimated New Utilization									
	Processor		Memory				Disk			Network
	% Used	Queue per CPU per GHz	% Used	File Sys Cache (MB)	Page File %	Paging (Pg/sec)	I/O (Trans/sec)	I/O (MB/sec)	Disk Utilization (TB)	Speed (MB/sec)
Before Analysis	3.47	0.05	52.71	58,887.56	4.38	11,424.21	2,256.28	117.48	15.234	118.93
New System Totals	35.40	0.49	76.76	58,583.83	9.44	10,406.72	1,927.27	88.01	-	97.83
After Analysis	35.40	0.49	76.76	58,583.83	9.44	10,406.72	1,927.27	88.01	0.000	97.83
Systems Savings	-31.93	-0.43	-24.06	303.74	-5.06	1,017.50	329.01	29.47	15.234	21.10

2.1.2 Candidate System Selection Criteria

The selection of the input systems was controlled by these conditions. This list of restrictions is defined within the source selection criteria of the scenario.

All monitored systems are included in the consolidation.

2.1.3 Placement Rules

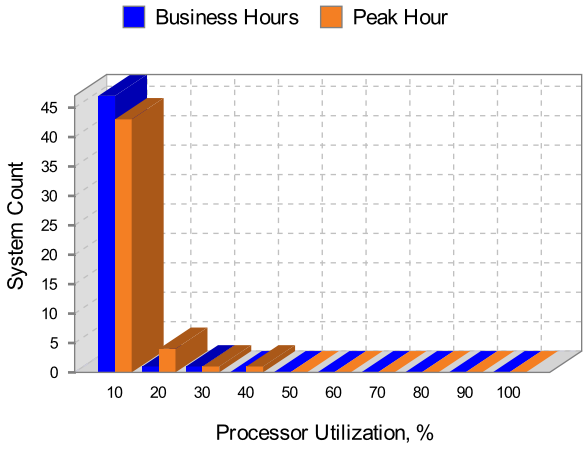
The analysis engine uses rules to determine how to group systems. The rules include group boundaries, resource utilization limits, and virtualization platforms. For this scenario, the following rules were applied.

- Cross boundaries
  - Merge locations
  - Merge departments
  - Merge environments
  - Merge functions
  - Merge network subnets
  - Merge operating systems
- Virtualize using ESX 5.0.x Server
- Don't use vStorage Composer
- Processor architecture merge
  - Merge all architectures
- Redeployment rules
  - Only redeploy to new hardware
- Memory reclamation
  - Use included software profile properties to determine memory sharing requirements.
- Resource utilization limits
  - Stack processor load to 80%
  - Stack processor queue per CPU to 6
  - Stack memory load to 80%
  - Stack file system cache to 600MB
  - Stack page file to 90%
  - Stack disk I/O(Transfers/Sec) to 100.0%
  - Stack disk I/O(MB/Sec) to 0.0%
  - Stack network I/O to 21.0%

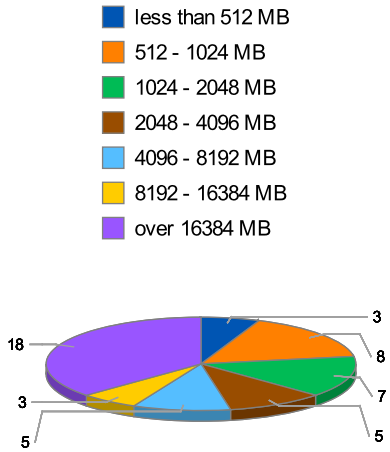
2.1.4 Hardware Selection

The scenario was configured to reuse hardware when possible.

Number of Systems by Processor Utilization



Number of Systems by Memory Capacity



Make: Dell

Model: PowerEdge R710

Hardware Component	Number	Size, Speed
CPUs	12	2530 MHz
RAM		196608 MB
Network Interface Cards	2	10000 MB/sec
Disk I/O		999999999 MB/sec
Disk Storage		400 GB

2.1.5 System Exceptions

VMware Capacity Planner generates exceptions whenever a system will not fit on a target host. The reasons can vary from "not enough information" to "host specification is too small." Systems with missing information are not scenario specific and are not shown in this list. This list shows only systems that could not be placed because insufficient resources.

No exception systems

2.2 Scenario 2: Moderate

2.2.1 Scenario Results Summary

The following tables show the summary results for this scenario. Each scenario has different rules for analysis. The rules can affect any of the numbers in the tables. These numbers are specific to this scenario and can be compared to other scenarios to determine the optimum configuration.

Systems Analyzed	ESX Hosts Required	System Exceptions	Overall Consolidation Ratio %	Total Storage Required (TB)	Rack Used	KW Used	Tons BTU/hr Used
49	4	0	92	0.000	8.0	2.28	0.65

2.2.1.1 Hardware Capacity and Environment Summary

The following table shows the capacity and environment requirements for the hardware chosen and the number of systems needed to support the analyzed systems. A reduction in capacity and data center environment effect is usually realized.

VMware Capacity Planner uses the name plate rating to determine the environmental requirements. Capacity Planner does not always have the environment specifications for the input systems. In the case where information is missing, the results show an increase in environment requirements when it is not the case.

	Capacity								
	Processors	Memory	Disk	Network		Physical			
	Speed (GHz)	Size (GB)	Size (TB)	Count	Speed (Gb/sec)	Rack Units	Weight (lbs)	Power (KW)	Thermal (Tons BTU/hr)
Before Analysis	459.81	491.40	354.08	110	106.40	60.0	1,788.00	21.89	5.175
New System Totals	72.62	768.00	1.60	8	80.00	8.0	192.00	2.28	0.648
After Analysis	72.62	768.00	1.60	8	80.00	8.0	192.00	2.28	0.648
Systems Savings	387.19	-276.60	352.48	102	26.40	52.0	1,596.00	19.61	4.527

After analysis disk size is a sum of individual host disk capacities. It might be surpassed by the actual disk utilization after consolidation.

2.2.1.2 Resource Utilization Summary

The analysis engine estimates utilization based on the new hardware selection, analysis rules, and capacity totals. This summary is unique to this scenario.

	Estimated New Utilization									
	Processor		Memory				Disk			Network
	% Used	Queue per CPU per GHz	% Used	File Sys Cache (MB)	Page File %	Paging (Pg/sec)	I/O (Trans/sec)	I/O (MB/sec)	Disk Utilization (TB)	Speed (MB/sec)
Before Analysis	3.47	0.05	52.71	58,887.56	4.38	11,424.21	2,256.28	117.48	15.234	118.93
New System Totals	19.26	0.26	43.09	58,708.84	4.75	10,561.03	2,134.48	96.04	-	109.39
After Analysis	19.26	0.26	43.09	58,708.84	4.75	10,561.03	2,134.48	96.04	0.000	109.39
Systems Savings	-15.80	-0.20	9.62	178.72	-0.38	863.19	121.80	21.44	15.234	9.54

2.2.2 Candidate System Selection Criteria

The selection of the input systems was controlled by these conditions. This list of restrictions is defined within the source selection criteria of the scenario.

All monitored systems are included in the consolidation.

2.2.3 Placement Rules

The analysis engine uses rules to determine how to group systems. The rules include group boundaries, resource utilization limits, and virtualization platforms. For this scenario, the following rules were applied.

- Cross boundaries
  - Merge locations
  - Merge departments
  - Merge environments
  - Merge functions
  - Merge network subnets
  - Merge operating systems
- Virtualize using ESX 5.0.x Server
- Don't use vStorage Composer
- Processor architecture merge
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- Redeployment rules
  - Only redeploy to new hardware
- Memory reclamation
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- Resource utilization limits
  - Stack processor load to 50%
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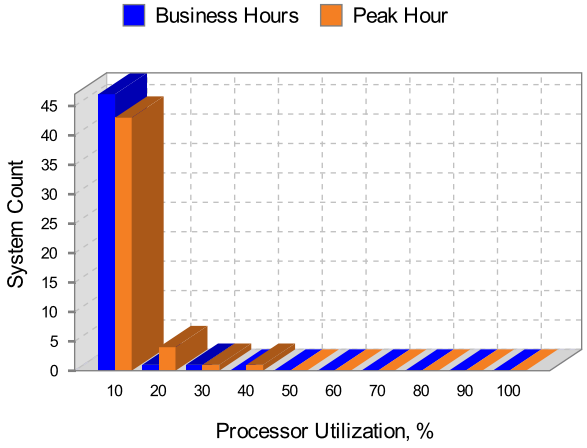
  - Stack memory load to 50%
  - Stack file system cache to 600MB
  - Stack page file to 90%
  - Stack disk I/O(Transfers/Sec) to 100.0%
  - Stack disk I/O(MB/Sec) to 0.0%
  - Stack network I/O to 21.0%

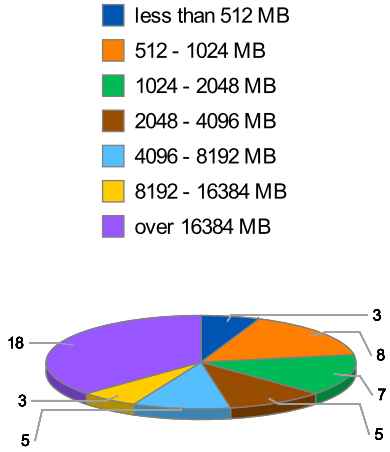
2.2.4 Hardware Selection

The scenario was configured to reuse hardware when possible.

Number of Systems by Processor Utilization



Number of Systems by Memory Capacity



Make: Dell

Model: PowerEdge R710

Hardware Component	Number	Size, Speed
CPUs	12	2530 MHz
RAM		196608 MB
Network Interface Cards	2	10000 MB/sec
Disk I/O		999999999 MB/sec
Disk Storage		400 GB

2.2.5 System Exceptions

VMware Capacity Planner generates exceptions whenever a system will not fit on a target host. The reasons can vary from "not enough information" to "host specification is too small." Systems with missing information are not scenario specific and are not shown in this list. This list shows only systems that could not be placed because insufficient resources.

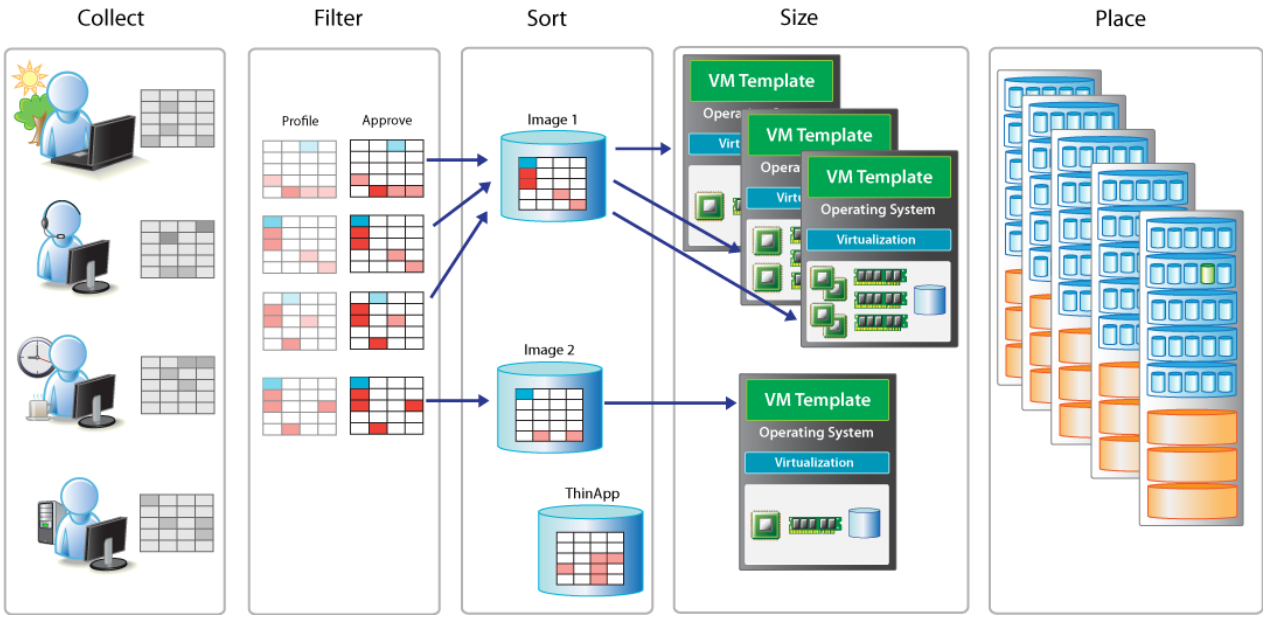
No exception systems

Section 3: Software Usage Report

Virtualization often includes standardization on hardware and software to save money in license cost and support time. Desktop virtualization benefits from software standardization greatly because of to the scale of number of desktops that will be standardized.

Desktop virtualization depends heavily on application analysis. Application analysis helps build virtual machine templates with the correct combination of applications and proper computational resource sizes to match the user population. Application analysis can also benefit system virtualization. This is especially true with web-based services.

Application analysis is achieved through multiple steps. Applications and application usage must be collected, filtered, and sorted into images. After images are generated, users are mapped to those images, and virtual machine templates are sized. The final step is to recommend the placement of users on ESX hosts.



3.1 Collect

The list of collected systems, operating systems, and applications is listed out in Section 6. These lists are often too large to summarize in this section. The value starts after application filtering is performed. Application filtering is described below.

3.2 Filter

VMware Capacity Planner discovers, catalogs, and profiles applications running on systems. This process is called software profiling and works like many virus scanners. Each software profile has a signature to find installed applications or operating systems. The application does not need to be installed using

standardized installers. An application can be found by searching for a process, service, or installed application.

The software profile provides a layer of abstraction that allows several applications to be treated as a single application or multiple minor revisions to be treated as a single version. This approach simplifies the management and analysis of software.

After a software profile detects the software other information becomes available about that software. Software profiles allow users to adjust and apply qualities to an application. Applications can be marked as candidates for virtualization or VMware ThinApp. Information such as the amount of reclaimable memory or disk space is also available for an application. These properties allow Capacity Planner to calculate the maximum savings during virtualization analysis.

Software profiling gives Capacity Planner the ability to standardize applications or operating systems during analysis. A software profile can be linked to another profile, indicating that standardization should occur if this application is found. A company can standardize on their favorite office suite or the best version of an operating system that runs in a virtual environment.

3.2.1 Approved Application Software List

The Approved Application Software is a list of applications that match one of the VMware Capacity Planner software profiles and is approved for virtualization in this assessment. All of the following applications are identified as real applications.

No approved applications

3.2.2 Excluded Application Software List

Excluded applications are applications that the assessor marked as "excluded" or met conditions that determined that the application was not needed or not compatible with virtualization. The list includes the exclusion reason and the number of systems that are affected.

No excluded applications

3.3 Sort

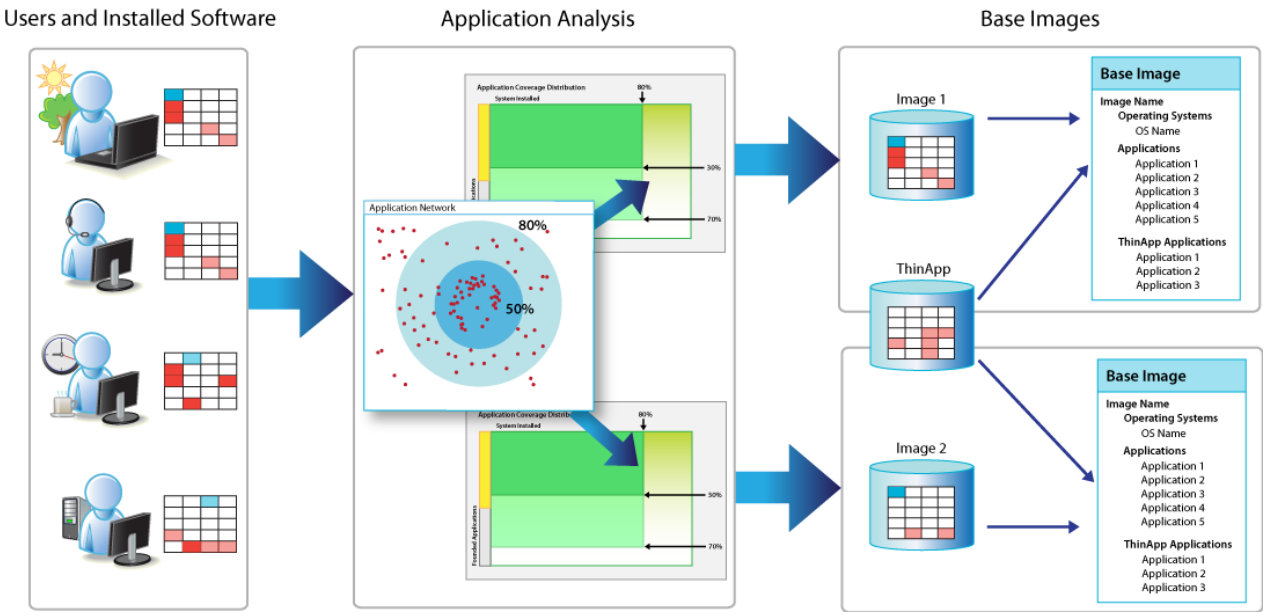
VMware Capacity Planner performs application installation analysis for all the systems to create a set of base images. Software profiles rather than the installed applications are used to perform this analysis. Software profiles allow you to distinguish the installed applications so that creating base images is possible and users have more control.

Application analysis analyzes software installation patterns to create the fewest number of base images needed to create virtual machine templates. The user can control the number of base images to build. A clustering algorithm uses the population application usage statistics to build the number of images.

Creating a smaller number of base images than the number of users might create images that have applications that are used only by a few users. The analysis engine minimizes this effect to reduce wasted

licenses. The analysis engine understands the cost of each application and allows more waste of cheaper or free applications than expensive applications.

The following diagram shows the steps for application installation analysis. This analysis is based solely on inventory information. Virtual machine template sizing analyzes the user's usage of the application by using application specific performance information.



Application inventory analysis creates two types of images:

- Base images
- ThinApp images

Base images are used to create virtual machine templates. A virtual machine template has an operating system, applications, and virtual machine sizing parameters. The base image will also have desktop links to ThinApp images that are stored centrally.

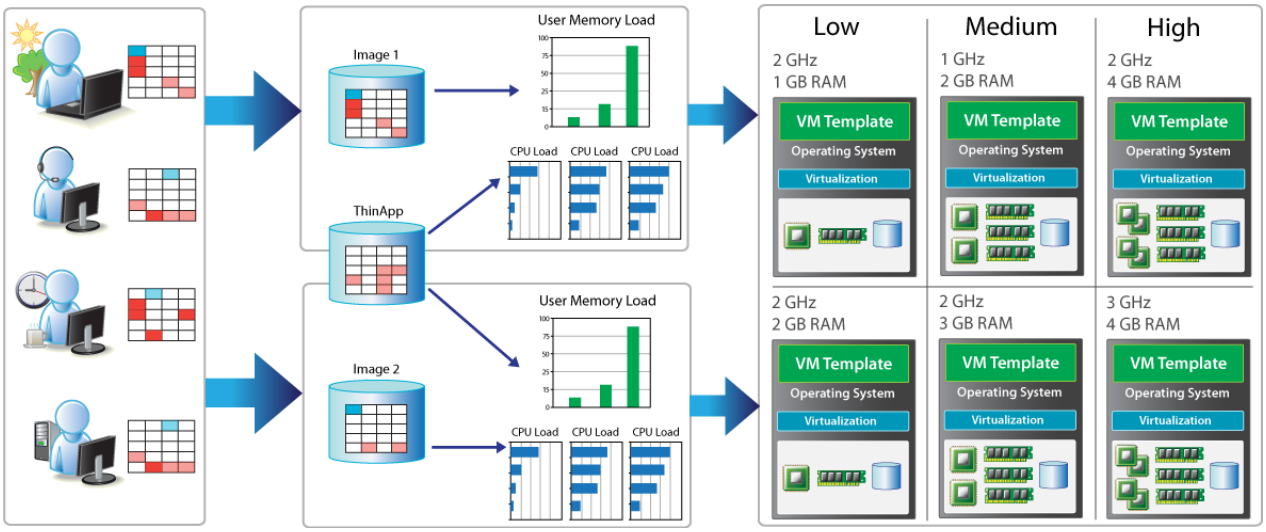
ThinApp images are the set of applications that are marked as application virtualization candidates and are approved for corporate use. The ThinApp images are created and managed external to the virtual machine templates. ThinApp can be used to virtualize applications without virtualizing the systems they are installed on.

3.4 Size

Similar to creating base images, you can use virtual machine templates meet the usage patterns with the least amount of wasted resources. Creating vitual machine templates that are too large allocates virtual devices that are not needed and makes virtual machines less portable across host configurations.

Virtual machine template sizing uses the base images and the systems that are mapped to them to build a population distribution for each base image. The population is divided into 3 divisions based on processor and memory demand. Capacity Planner builds virtual machine templates that meet the needs for each division and creates a report that shows all the relationships.

The diagram below shows how the process works at a high level.



The virtual machine template creation process generates the following reports:

- Virtual Machine Template Report
- System to Virtual Machine Mapping Report

Virtual machine templates are not mandatory for every assessment. If the option has been selected, it will be shown in detail in the next section. If it has not been selected, then the next section will show the placement results.

3.5 System Placement

System placement is the last step in the process and includes the count of ESX hosts required to accommodate the source systems. System placement is not strictly part of the software usage report, but it is part of the analysis flow that generates the software usage reports. Placement is described in detail in other sections. Use those sections to learn more and see the results. The placement results are located in two sections:

- Section 1.3 has a Summary Overview of the scenarios
- Section 4 has the placement details

Section 4: System Selection and Placement

The tables below show Aggressive input systems and the detailed placement result.

4.1 Source Systems

		Capacity										Utilization										
		Processors		Memory	Disk	Network		Physical				Processor		Memory				Disk				Network
System Name	Make/Model	Count	Speed (MHz)	Size (MB)	Size (GB)	Count	Speed (Mb/sec)	Rack Units	Weight (lbs)	Power (KW)	Thermal (BTU/hr)	% Used	Queue per CPU per GHz	% Used	File Sys Cache (MB)	Page File %	Paging (Pg/sec)	I/O (Trans/sec)	I/O (MB/sec)	Read Speed (MB/Sec)	Write Speed (MB/Sec)	Speed (MB/sec)
banssb1.fhda.edu	HP/ProLiant DL360 G5	8	3,000	16,384	146.77	3	3,000	1	50.00	0.85	2,000.00	0.51	0.01	68.99	3,906.25	0.00	80.15	4.03	0.06	0.00	0.06	0.12
URQUAN	Dell/PowerEdge 2650	2	1,989	512	164.99	4	2,200	2	55.00	0.34	1,159.70	0.04	0.00	24.82	34.18	0.29	0.03	1.26	0.01	0.00	0.01	0.00
BOOKMYNE	Dell/PowerEdge 1850	4	3,192	2,048	0.00	0	0	1	35.00	0.44	1,509.50	0.91	0.00	31.08	257.64	0.27	4.13	4.76	0.04	0.02	0.03	0.01
GOPRNSRV	Dell/PowerEdge 2650	2	1,794	1,024	36.40	2	2,000	2	55.00	0.34	1,159.70	5.06	0.14	41.63	80.27	0.73	0.64	10.28	0.30	0.00	0.30	0.01
TRISTRAM	Dell Inc./PowerEdge 1950	8	2,493	16,384	0.00	0	0	1	36.00	0.51	1,746.00	2.15	0.00	18.43	573.38	0.00	0.41	0.13	0.00	0.00	0.00	0.00
BANDOC	HP/ProLiant DL360 G5	4	3,000	24,576	1,309.85	2	2,000	1	50.00	0.85	2,000.00	6.27	0.01	90.89	421.96	19.99	152.12	168.17	1.51	0.62	0.89	0.21
SIMBA	Dell/PowerEdge 2650	2	1,790	512	36.40	2	2,000	2	55.00	0.34	1,159.70	11.77	0.16	69.17	91.13	2.21	2.73	7.42	0.06	0.02	0.05	0.01
OAHU	AT/AT COMPATIBLE/AT/AT COMPATIBLE	4	1,862	4,864	0.00	0	0	0	0.00	0.00	0.00	0.12	0.00	28.43	128.90	0.29	0.58	1.48	0.01	0.00	0.01	0.02
RESEARCHDW	Dell/PowerEdge 2650	4	2,783	3,840	183.19	2	2,000	2	55.00	0.34	1,159.70	0.86	0.00	12.27	162.22	0.32	1,610.85	206.17	13.94	6.97	6.98	6.62
SEVISWEB	Dell/PowerEdge 2650	2	2,392	1,024	36.40	2	2,000	2	55.00	0.34	1,159.70	0.21	0.00	31.54	123.57	0.22	0.41	1.66	0.01	0.00	0.01	0.01
BARCODE	Dell/PowerEdge 750	1	2,800	512	72.83	2	2,000	1	26.00	0.24	808.30	1.23	0.05	37.69	76.14	0.49	4.32	3.27	0.04	0.02	0.01	0.00
PUMBAA2	Dell Inc./PowerEdge SC440	1	1,795	2,046	160.00	1	1,000	0	0.00	0.00	0.00	0.73	1.15	16.08	90.19	0.21	2.04	2.35	0.04	0.01	0.02	0.00
lumweb1	HP/ProLiant DL360 G5	8	3,000	16,384	146.78	3	3,000	1	50.00	0.85	2,000.00	0.92	0.00	63.07	3,867.38	0.00	103.24	2.61	0.04	0.00	0.04	0.06
banods	HP/ia64 hp server rx2660	2	1,595	32,747	3,315.86	0	0	0	0.00	0.80	2,724.00	32.91	0.65	67.43	0.00	55.04	3.57	724.24	24.10	0.00	0.00	94.88
ECMS2	Dell Inc./PowerEdge R610	8	1,596	12,288	146.16	6	6,000	0	0.00	0.00	0.00	0.94	0.00	44.35	3,506.88	0.10	97.92	0.75	0.04	0.03	0.01	0.48
LIQUIDWEB	Dell/PowerEdge 1850	4	2,992	2,048	146.69	2	2,000	1	35.00	0.44	1,509.50	1.11	0.01	29.56	163.61	0.26	2.81	3.43	0.05	0.01	0.05	0.03
SEVIS1	Dell Inc./PowerEdge R410	16	2,394	32,768	1,999.84	2	2,000	0	0.00	0.00	0.00	0.03	0.01	10.63	210.60	0.00	0.42	0.05	0.00	0.00	0.00	0.00
FRONTIER	Dell/PowerEdge 1850	4	2,792	2,048	146.69	2	2,000	1	35.00	0.44	1,509.50	1.16	0.01	25.67	68.50	0.19	3.86	0.36	0.00	0.00	0.00	0.00
SARS2	Not Provided/(4) 3000 MHz Processors	4	2,992	1,024	73.27	2	2,000	4	85.00	0.90	1,089.00	0.92	0.00	39.62	181.32	1.06	50.42	11.70	0.26	0.20	0.08	0.05
lumweb3	HP/ProLiant DL360 G5	8	3,000	16,384	146.78	3	3,000	1	50.00	0.85	2,000.00	1.19	0.01	84.36	3,906.25	0.00	48.46	2.38	0.06	0.00	0.06	0.06

		Capacity										Utilization										
		Processors		Memory	Disk	Network		Physical				Processor		Memory				Disk				Network
System Name	Make/Model	Count	Speed (MHz)	Size (MB)	Size (GB)	Count	Speed (Mb/sec)	Rack Units	Weight (lbs)	Power (KW)	Thermal (BTU/hr)	% Used	Queue per CPU per GHz	% Used	File Sys Cache (MB)	Page File %	Paging (Pg/sec)	I/O (Trans/sec)	I/O (MB/sec)	Read Speed (MB/Sec)	Write Speed (MB/Sec)	Speed (MB/sec)
PUMBAA	Not Provided/(1) 548 MHz Processors	1	548	256	13.03	0	0	6	66.00	0.35	497.00	0.13	6.16	44.69	34.99	0.57	0.13	1.92	0.01	0.00	0.01	0.00
BANMGMT	HP/ProLiant DL360 G5	8	3,000	33,536	11,077.45	3	3,000	1	50.00	0.85	2,000.00	5.90	0.00	38.04	3,906.25	15.03	7,167.81	838.79	38.38	29.68	27.83	0.19
lumweb2	HP/ProLiant DL360 G5	8	3,000	16,384	146.78	3	3,000	1	50.00	0.85	2,000.00	0.90	0.00	85.08	3,906.25	0.00	39.66	2.03	0.05	0.00	0.05	0.06
STSWEB	AT/AT COMPATIBLE/AT/AT COMPATIBLE	4	2,392	1,024	0.00	2	2,000	0	0.00	0.00	0.00	1.49	0.01	47.46	200.89	0.86	15.61	6.29	0.10	0.03	0.07	0.03
lumweb4	HP/ProLiant DL360 G5	8	3,000	16,384	146.78	3	3,000	1	50.00	0.85	2,000.00	0.76	0.01	95.98	3,906.25	0.00	59.33	2.06	0.04	0.00	0.04	0.06
LEOPARD	Dell/PowerEdge 1850	4	2,992	2,048	3,156.38	2	2,000	1	35.00	0.44	1,509.50	15.60	1.52	45.30	456.93	1.34	60.16	90.99	1.05	0.25	0.81	0.00
FILEMAKER2	Dell Inc./PowerEdge R510	16	2,400	16,384	299.42	4	4,000	0	0.00	0.00	0.00	0.81	0.00	15.30	224.30	0.00	0.65	0.10	0.00	0.00	0.00	0.00
KONA	Dell Inc./PowerEdge 1950	4	1,862	8,960	299.43	0	0	1	36.00	0.51	1,746.00	0.69	0.00	23.68	330.69	6.33	6.46	3.13	0.04	0.01	0.03	0.05
YOSEMITE	Dell Inc./PowerEdge R710	16	2,394	65,536	0.00	0	0	0	0.00	0.00	0.00	7.36	0.08	31.26	1,198.62	0.00	6.52	0.27	0.01	0.00	0.01	0.27
SARSFHWEB	Dell Inc./PowerEdge 1950	2	2,327	4,864	72.74	2	2,000	1	36.00	0.51	1,746.00	1.04	0.02	28.41	155.73	0.92	65.34	22.36	0.31	0.17	0.14	0.16
SARSFHAPP	Dell Inc./PowerEdge 1950	2	1,995	2,048	146.16	2	2,000	1	36.00	0.51	1,746.00	0.13	0.01	30.03	179.66	0.64	0.89	2.14	0.02	0.00	0.02	0.02
LOUISE	Dell/PowerEdge 1750	2	2,789	1,024	36.36	2	2,000	1	35.00	0.35	1,180.60	1.13	0.00	38.39	121.71	0.40	0.78	2.15	0.02	0.00	0.02	0.01
SEVISDEV	Dell/PowerEdge 2650	2	2,392	1,024	73.39	2	2,000	2	55.00	0.34	1,159.70	0.15	0.00	38.26	85.01	0.49	0.00	1.63	0.39	0.19	0.20	0.00
LIQUIDDEV	Dell/PowerEdge 2400	2	728	1,024	45.49	2	200	6	55.00	0.33	1,125.00	1.07	0.09	51.89	69.41	0.56	0.15	1.70	0.01	0.00	0.01	0.00
KMS	Dell Inc./PowerEdge R410	16	2,394	18,432	599.55	2	2,000	0	0.00	0.00	0.00	0.09	0.00	4.06	196.24	0.00	0.35	1.15	0.02	0.00	0.02	0.00
ECMS	Dell Inc./PowerEdge 1950	4	1,995	4,864	0.00	2	2,000	1	36.00	0.51	1,746.00	1.82	0.02	43.45	241.56	0.05	6.36	0.34	0.00	0.00	0.00	0.16
FILEMAKER	Dell/PowerEdge 1850	4	2,793	432	146.69	2	2,000	1	35.00	0.44	1,509.50	0.64	0.00	66.97	123.68	0.82	2.92	3.73	0.03	0.01	0.02	0.01
daproxy.fhda.edu	Dell/PowerEdge 1850	1	2,993	4,096	36.36	2	2,000	1	35.00	0.44	1,509.50	3.56	0.03	82.66	2,043.49	0.00	20.75	1.90	0.06	0.00	0.06	0.17
bandw1.fhda.edu	HP/ProLiant DL360 G5	8	3,000	24,576	146.77	3	3,000	1	50.00	0.85	2,000.00	4.43	0.02	99.35	805.51	14.02	212.25	8.65	0.10	0.01	0.09	1.68
lumtest.fhda.edu	Sun Microsystems/Sun Fire X4100 Server	4	2,593	8,192	73.00	5	5,000	0	0.00	0.00	0.00	1.37	0.01	49.96	1,562.46	0.00	17.04	1.67	0.19	0.15	0.04	0.01
banssb2.fhda.edu	HP/ProLiant DL360 G5	8	3,000	16,384	146.77	3	3,000	1	50.00	0.85	2,000.00	0.36	0.00	63.42	3,906.25	0.00	66.73	3.65	0.06	0.00	0.06	0.07
munich.fhda.edu	Dell/PowerEdge 1850	2	2,993	6,144	2,345.75	4	4,000	1	35.00	0.44	1,509.50	22.60	0.11	99.04	2,774.21	88.54	482.45	31.97	4.73	4.55	0.49	2.12
baninb1.fhda.edu	HP/ProLiant DL360 G5	8	3,000	16,384	322,768.84	3	3,000	1	50.00	0.85	2,000.00	11.15	0.03	91.36	3,906.25	0.00	112.90	21.41	11.00	10.84	0.18	5.28
dastream1.fhda.edu	Dell/PowerEdge 2650	2	2,392	2,048	2,547.29	3	3,000	2	55.00	0.34	1,159.70	1.96	0.02	96.05	1,478.62	0.00	681.03	17.80	0.12	0.10	0.04	0.12
omni.fhda.edu	Dell/PowerEdge 1750	2	2,400	3,072	36.36	2	2,000	1	35.00	0.35	1,180.60	1.47	0.03	28.95	431.03	0.00	1.25	0.09	0.01	0.00	0.01	0.01
dadata.fhda.edu	Dell/PowerEdge 2650	2	2,791	2,048	329.99	4	4,000	2	55.00	0.34	1,159.70	1.32	0.01	66.37	877.72	0.00	19.92	1.64	0.04	0.00	0.04	0.02

		Capacity										Utilization										
		Processors		Memory	Disk	Network		Physical				Processor		Memory				Disk				Network
System Name	Make/Model	Count	Speed (MHz)	Size (MB)	Size (GB)	Count	Speed (Mb/sec)	Rack Units	Weight (lbs)	Power (KW)	Thermal (BTU/hr)	% Used	Queue per CPU per GHz	% Used	File Sys Cache (MB)	Page File %	Paging (Pg/sec)	I/O (Trans/sec)	I/O (MB/sec)	Read Speed (MB/Sec)	Write Speed (MB/Sec)	Speed (MB/sec)
baninb2.fhda.edu	HP/ProLiant DL360 G5	8	3,000	16,384	646.84	3	3,000	1	50.00	0.85	2,000.00	17.82	0.02	56.10	3,906.25	0.00	98.02	4.53	18.60	7.28	11.33	5.23
LIQUIDSQL	Dell/PowerEdge 1750	2	2,783	3,840	73.27	2	2,000	1	35.00	0.35	1,180.60	2.62	0.01	50.08	100.96	0.33	0.78	20.40	1.11	0.55	0.57	0.01
voyager.deanza.edu	Dell Inc./PowerEdge 1950	8	2,494	16,384	399.43	3	3,000	1	36.00	0.51	1,746.00	1.04	0.00	81.84	3,906.25	1.81	108.86	5.29	0.36	0.00	0.36	0.62

4.2 Exception Systems

No exception systems

4.3 Detailed Placement Results

Department: All Departments
Environment: All Environments
Function: All Functions
Location: All Locations
Operation System: All Operating Systems
Architecture: All Architectures

		Capacity										Estimated New Utilization										
		Processors		Memory	Disk	Network		Physical				Processor		Memory				Disk				Network
Target System Name	Source System Name(s)	Count	Speed (MHz)	Size (MB)	Size (GB)	Count	Speed (Mb/sec)	Rack Units	Weight (lbs)	Power (KW)	Thermal (BTU/hr)	% Used	Queue per CPU per GHz	% Used	File Sys Cache (MB)	Page File %	Paging (Pg/sec)	I/O (Trans/sec)	I/O (MB/sec)	Read Speed (MB/Sec)	Write Speed (MB/Sec)	Speed (MB/sec)
Phantom0-1	(Totals)	12	2,530	196,608	400.00	2	20,000	2	48.00	0.57	1,945.00	18.19	0.05	76.75	42,903.06	5.52	8,250.96	941.31	40.41	NA	NA	2.50
	banssb1.fhda.edu	1	100	14,336			10					0.22	0.00	5.91	3,906.25	0.00	80.11	4.03	0.05	0.00	0.05	0.03
	URQUAN	1	100	256			10					0.00	0.00	0.12	33.95	0.00	0.01	0.92	0.01	0.00	0.01	0.00
	GOPRNSRV	1	200	768			10					0.60	0.01	0.27	79.76	0.00	0.01	2.20	0.01	0.00	0.01	0.00
	TRISTRAM	1	400	3,840			10					1.25	0.00	1.61	566.10	0.00	0.06	0.06	0.00	0.00	0.00	0.00
	OAHU	1	100	1,792			10					0.04	0.00	0.77	128.45	0.01	0.00	1.17	0.01	0.00	0.01	0.00
	SEVISWEB	1	100	512			10					0.03	0.00	0.22	123.25	0.00	0.23	1.41	0.01	0.00	0.01	0.00
	BARCODE	1	100	256			10					0.10	0.00	0.15	76.14	0.00	3.16	2.66	0.02	0.01	0.01	0.00
	lumweb1	1	200	13,056			10					0.78	0.00	5.40	3,862.25	0.00	100.52	2.58	0.02	0.00	0.02	0.02
	ECMS2	1	100	6,912			10					0.27	0.00	2.84	3,469.99	0.01	6.72	0.11	0.00	0.00	0.01	0.02
	LIQUIDWEB	1	100	768			10					0.43	0.00	0.36	162.59	0.00	0.67	2.16	0.02	0.00	0.02	0.00
	SEVIS1	1	100	4,608			10					0.03	0.01	1.83	210.12	0.00	0.00	0.03	0.00	0.00	0.00	0.00
	SARS2	1	100	512			10					0.22	0.00	0.26	178.82	0.01	3.18	4.32	0.04	0.01	0.08	0.00
	lumweb3	1	300	17,408			10					0.56	0.00	7.21	3,906.25	0.00	47.94	2.37	0.04	0.00	0.04	0.02

Department: All Departments | Environment: All Environments | Function: All Functions

Location: All Locations | Operation System: All Operating Systems | Architecture: All Architectures

		Capacity										Estimated New Utilization									
		Processors		Memory	Disk	Network		Physical				Processor		Memory				Disk				Network
Target System Name	Source System Name(s)	Count	Speed (MHz)	Size (MB)	Size (GB)	Count	Speed (Mb/sec)	Rack Units	Weight (lbs)	Power (KW)	Thermal (BTU/hr)	% Used	Queue per CPU per GHz	% Used	File Sys Cache (MB)	Page File %	Paging (Pg/sec)	I/O (Trans/sec)	I/O (MB/sec)	Read Speed (MB/Sec)	Write Speed (MB/Sec)	Speed (MB/sec)
	BANMGMT	1	1,100	16,128			10					0.44	0.00	6.42	3,906.25	2.38	7,167.81	838.79	38.38	29.68	27.83	0.19
	lumweb2	1	200	17,664			10					0.78	0.00	7.26	3,906.25	0.00	39.28	2.02	0.04	0.00	0.04	0.01
	STSWEB	1	200	768			10					0.49	0.00	0.31	200.37	0.00	4.49	4.10	0.05	0.01	0.04	0.00
	FILEMAKER2	1	200	3,328			10					0.55	0.00	1.34	224.30	0.00	0.32	0.07	0.00	0.00	0.00	0.00
	KONA	1	100	2,816			10					0.22	0.00	1.06	312.11	0.15	0.01	1.29	0.01	0.00	0.02	0.00
	SARSFHWEB	1	100	1,792			10					0.17	0.00	0.74	148.51	0.02	2.76	3.68	0.03	0.01	0.03	0.00
	SARSFHAPP	1	100	1,024			10					0.01	0.00	0.36	176.06	0.01	0.00	1.32	0.01	0.00	0.01	0.00
	SEVISDEV	1	100	512			10					0.03	0.00	0.26	84.86	0.00	0.00	1.20	0.01	0.00	0.01	0.00
	ECMS	1	200	2,816			10					0.45	0.00	1.14	211.45	0.00	0.06	0.18	0.00	0.00	0.00	0.00
	daproxy.fhda.edu	1	200	4,352			10					0.31	0.00	1.78	2,010.33	0.00	15.60	1.65	0.02	0.00	0.03	0.02
	lumtest.fhda.edu	1	200	5,120			10					0.08	0.00	2.14	1,562.46	0.00	16.92	1.66	0.13	0.09	0.02	0.00
	banssb2.fhda.edu	1	100	13,056			10					0.18	0.00	5.43	3,906.25	0.00	66.68	3.65	0.05	0.00	0.05	0.02
	munich.fhda.edu	1	1,300	7,680			10					6.23	0.01	3.20	2,774.21	2.77	468.44	31.32	0.39	0.26	0.13	2.12
	dastream1.fhda.edu	1	100	2,560			10					0.42	0.00	1.06	1,473.17	0.00	123.38	4.12	0.02	0.00	0.02	0.02
	omni.fhda.edu	1	100	1,280			10					0.12	0.00	0.51	430.52	0.00	1.23	0.09	0.00	0.00	0.00	0.00
	dadata.fhda.edu	1	100	1,792			10					0.23	0.00	0.75	865.57	0.00	15.16	1.38	0.03	0.00	0.04	0.01
	LIQUIDSQL	1	200	2,560			10					0.69	0.00	1.04	100.23	0.01	0.00	16.21	0.92	0.46	0.46	0.00
	voyager.deanza.edu	1	200	16,896			10					0.24	0.00	6.81	3,906.25	0.15	86.20	4.56	0.06	0.00	0.06	0.00
Phantom1-1	(Totals)	12	2,530	196,608	400.00	2	20,000	2	48.00	0.57	1,945.00	52.61	0.93	76.78	15,680.76	13.35	2,155.76	985.96	47.60	NA	NA	95.33
	BOOKMYNE	1	100	1,024			10					0.44	0.00	0.38	250.28	0.00	2.22	3.95	0.04	0.01	0.03	0.00
	BANDOC	1	600	28,160			10					0.30	0.00	11.51	421.96	2.50	8.04	118.63	0.07	0.00	0.07	0.00
	SIMBA	1	400	512			10					1.88	0.01	0.24	90.39	0.01	0.69	5.05	0.05	0.01	0.04	0.00
	RESEARCHDW	1	100	768			10					0.36	0.00	0.29	115.44	0.01	1,610.85	1.10	6.21	6.20	0.01	0.00
	PUMBAA2	1	100	512			10					0.02	0.07	0.23	86.85	0.00	0.02	1.78	0.01	0.00	0.01	0.00
	banods	1	1,000	27,648			100					4.24	0.06	11.12		9.08	0.06	724.24	10.47			94.88
	FRONTIER	1	100	768			10					0.31	0.00	0.32	67.82	0.00	2.26	0.16	0.00	0.00	0.00	0.00
	PUMBAA	1	100	256			10					0.00	0.10	0.11	34.86	0.00	0.02	1.58	0.01	0.00	0.01	0.00
	lumweb4	1	200	19,712			10					0.00	0.00	8.04	3,906.25	0.00	58.68	2.06	0.03	0.00	0.03	0.00
	LEOPARD	1	1,400	1,280			10					7.43	0.60	0.53	453.65	0.01	56.26	86.89	1.00	0.23	0.77	0.00
	YOSEMITE	1	1,500	25,856			10					4.15	0.07	9.27	1,166.91	0.00	6.23	0.12	0.00	0.00	0.00	0.01

Department: All Departments

Environment: All Environments

Function: All Functions

Location: All Locations

Operation System: All Operating Systems

Architecture: All Architectures

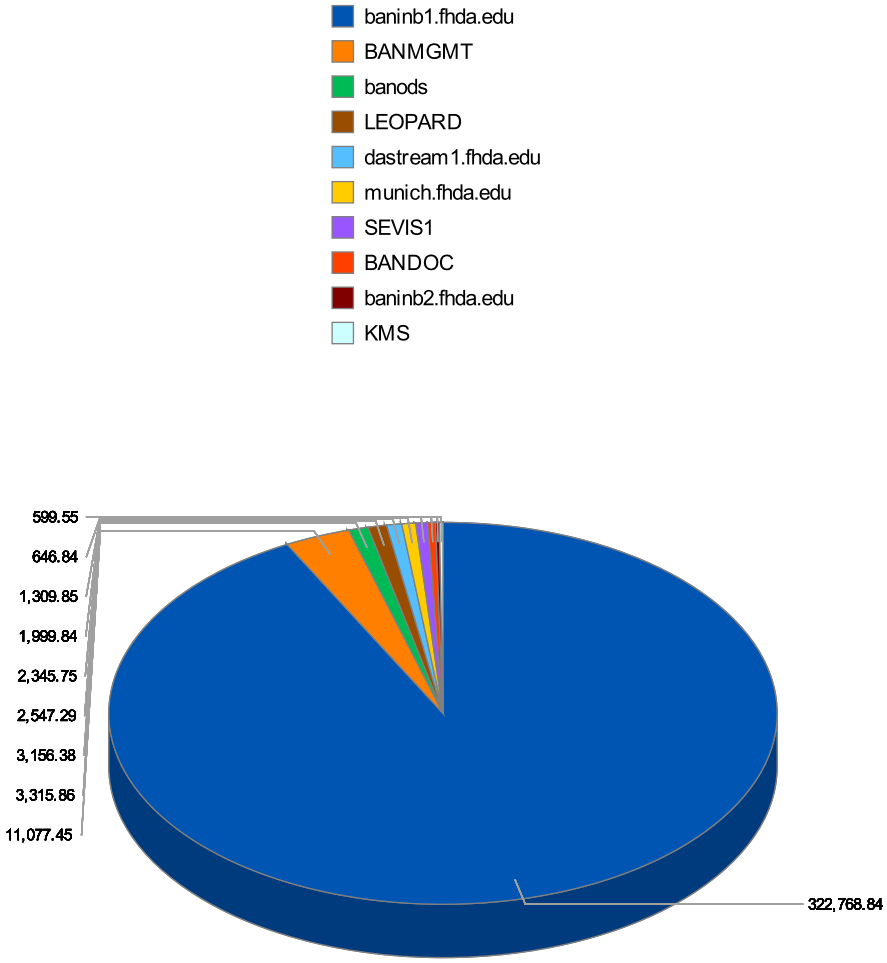
		Capacity										Estimated New Utilization									
		Processors		Memory	Disk	Network		Physical				Processor		Memory				Disk				Network
Target System Name	Source System Name(s)	Count	Speed (MHz)	Size (MB)	Size (GB)	Count	Speed (Mb/sec)	Rack Units	Weight (lbs)	Power (KW)	Thermal (BTU/hr)	% Used	Queue per CPU per GHz	% Used	File Sys Cache (MB)	Page File %	Paging (Pg/sec)	I/O (Trans/sec)	I/O (MB/sec)	Read Speed (MB/Sec)	Write Speed (MB/Sec)	Speed (MB/sec)
	LOUISE	1	100	512			10					0.22	0.00	0.26	120.42	0.00	0.00	1.49	0.02	0.00	0.02	0.01
	LIQUIDDEV	1	100	768			10					0.07	0.00	0.33	68.73	0.00	0.00	1.55	0.01	0.00	0.01	0.00
	KMS	1	100	1,024			10					0.06	0.00	0.43	192.33	0.00	0.00	0.92	0.01	0.00	0.01	0.00
	FILEMAKER	1	100	512			10					0.29	0.00	0.20	121.93	0.00	1.37	2.80	0.03	0.01	0.02	0.01
	bandw1.fhda.edu	1	800	30,720			10					3.57	0.00	12.69	770.46	1.73	204.21	7.74	0.05	0.00	0.05	0.01
	baninb1.fhda.edu	1	2,000	18,944			10					10.50	0.02	7.80	3,906.25	0.00	106.83	21.38	11.00	10.84	0.16	0.40
	baninb2.fhda.edu	2	3,100	11,520			10					16.77	0.00	4.88	3,906.25	0.00	98.02	4.52	18.60	7.28	11.33	0.01

Section 5: System Storage Report

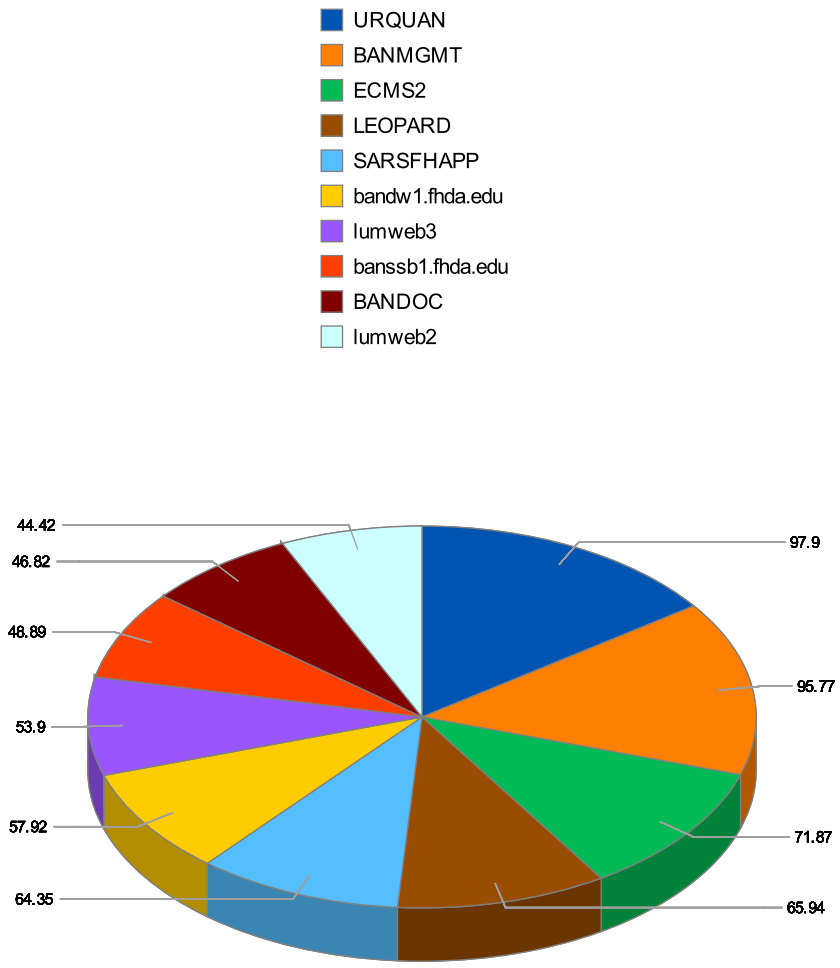
Virtualizing servers and desktops can significantly reduce storage requirements. Disk I/O capacity and disk space capacity are highly fragmented in a physical environment. This section shows the source environment breakdown of disk requirements.

The first two charts show the top 10 systems by disk space and disk I/O utilization. The third chart shows the top 10 profiled applications by disk space utilization. Virtualizing applications into virtual machine templates or by using VMware ThinApp can save a significant amount of disk space.

Top 10 System Disk Capacity, GB



Top 10 System Disk Utilization, %



Top 10 Software Profile Disk Utilization, GB

Not enough data to display graph

This is a list of individual systems showing filesystem and physical disk information. The filesystem information shows the space allocated and count of logical drives. The physical disk information shows the disk I/O measurements.

System Name	File Sys. Count	File Sys. Capacity (GB)	File Sys. Utilization (%)	Disk Count	Disk Capacity (GB)	Read (KB/sec)	Write (KB/sec)	Trans. Speed
BANDOC	2	1,219.88	46.82	2	1,309.85	604.26	872.94	168.17
bandw1.fhda.edu	2	130.50	57.92	2	146.77	10.10	92.43	8.65
baninb1.fhda.edu	10	581.39	32.11	7	322,768.84	10,587.18	174.19	21.41
baninb2.fhda.edu	10	579.67	32.10	3	646.84	7,106.58	11,060.09	4.53
BANMGMT	6	10,316.53	95.77	7	11,077.45	28,985.08	27,180.22	838.79
banods	12	2,586.00	37.93	13	3,315.86			724.24
banssb1.fhda.edu	8	75.20	48.89	2	146.77	0.03	62.39	4.03

System Name	File Sys. Count	File Sys. Capacity (GB)	File Sys. Utilization (%)	Disk Count	Disk Capacity (GB)	Read (KB/sec)	Write (KB/sec)	Trans. Speed
banssb2.fhda.edu	8	80.43	40.56	2	146.77	0.36	55.96	3.65
BARCODE	3	67.79	12.47	2	72.83	21.40	13.75	3.27
dadata.fhda.edu	3	300.08	8.08	8	329.99	0.21	42.36	1.64
daproxy.fhda.edu	2	25.25	28.11	2	36.36	0.71	62.67	1.90
dastream1.fhda.edu	3	2,329.15	19.41	5	2,547.29	95.39	41.40	17.80
ECMS2	2	136.05	71.87	1	146.16	29.05	12.88	0.75
FILEMAKER	2	136.55	4.76	1	146.69	10.16	23.75	3.73
FILEMAKER2	1	275.73	10.23	1	299.42	0.02	1.20	0.10
FRONTIER	1	136.58	36.15	1	146.69	1.03	1.64	0.36
GOPRNSRV	2	33.84	30.03	2	36.40	0.00	296.72	10.28
KMS	1	555.34	28.29	1	599.55	1.06	16.95	1.15
KONA	2	278.80	9.71	1	299.43	8.33	28.81	3.13
LEOPARD	4	2,939.54	65.94	3	3,156.38	241.96	789.74	90.99
LIQUIDDEV	2	42.36	34.88	2	45.49	1.38	7.29	1.70
LIQUIDSQL	2	68.20	16.99	1	73.27	532.39	555.12	20.40
LIQUIDWEB	1	136.58	14.42	1	146.69	10.17	45.74	3.43
LOUISE	2	33.82	26.86	1	36.36	3.14	18.40	2.15
lumtest.fhda.edu	2	60.51	38.13	3	73.00	148.97	42.71	1.67
lumweb1	2	122.98	41.12	2	146.78	1.74	36.54	2.61
lumweb2	10	55.33	44.42	2	146.78	0.01	50.35	2.03
lumweb3	10	45.78	53.90	2	146.78	0.88	62.25	2.38
lumweb4	2	122.98	28.69	2	146.78	0.03	40.81	2.06
munich.fhda.edu	3	1,138.37	22.47	6	2,345.75	4,446.64	482.29	31.97
OAHU	2	67.68	18.69	3	0.00	2.86	8.39	1.48
omni.fhda.edu	2	28.43	15.99	1	36.36	0.00	7.86	0.09
PUMBAA	1	12.13	17.23	1	13.03	0.03	9.34	1.92
PUMBAA2	2	148.93	4.97	1	160.00	14.03	23.66	2.35
SARSFHAPP	1	136.08	64.35	1	146.16	3.97	16.96	2.14
SARSFHWEB	1	67.71	20.36	1	72.74	163.02	139.98	22.36
URQUAN	3	153.59	97.90	2	164.99	0.00	6.57	1.26
voyager.deanza.edu	5	344.39	18.64	3	399.43	2.48	352.86	5.29

Section 6: Customer Environment Findings

This section shows all the information collected about the customer's environment to support the conclusion proposed in the first section. The supporting information is separated into each compute resource category followed by software information.

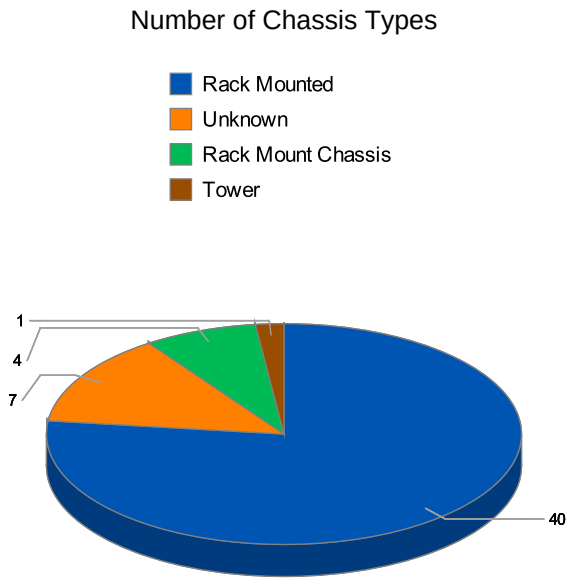
6.1 Chassis Information

Rack mount, blade, tower, desktop and laptop are all types of chassis that can be found during discovery. The chassis type is available through Windows Management Instrumentation and can be automatically discovered if the system is configured to allow WMI.

Chassis details help determine if systems are good candidates for virtualization. Because the virtualization options are flexible compared to traditional methods of consolidation, the chassis type does not restrict the ability to use virtualization.

The chassis type helps determine which virtualization option to apply to the system. Desktops might have a different strategy than servers.

6.1.1 Chassis Type Distribution

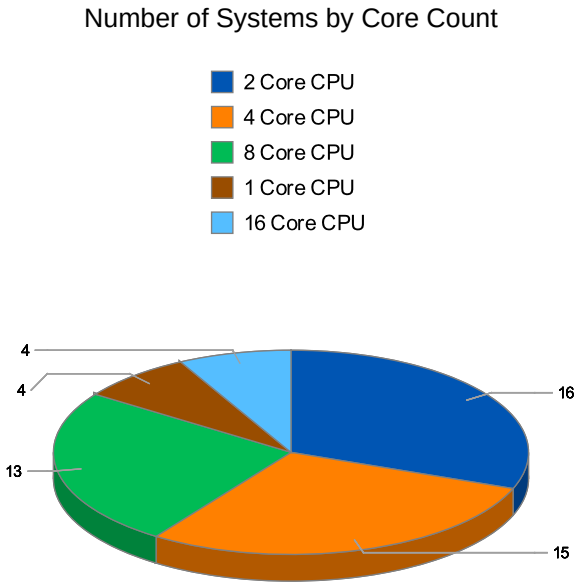


6.1.2 Depreciated Systems

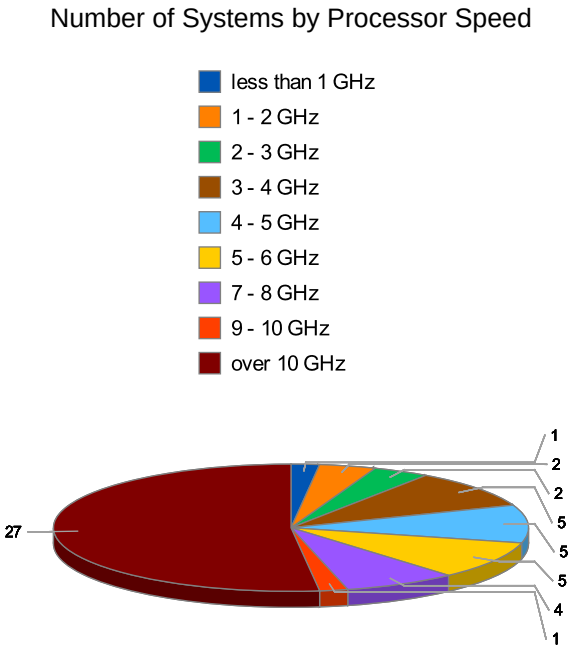
No depreciated systems are present

6.2 Processor Information

6.2.1 Processor Core Count Distribution

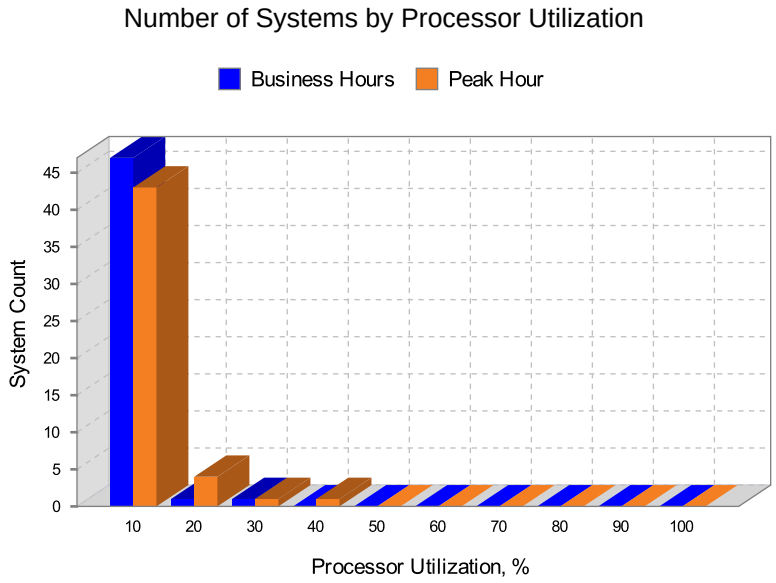


6.2.2 System Processor Speed Distribution



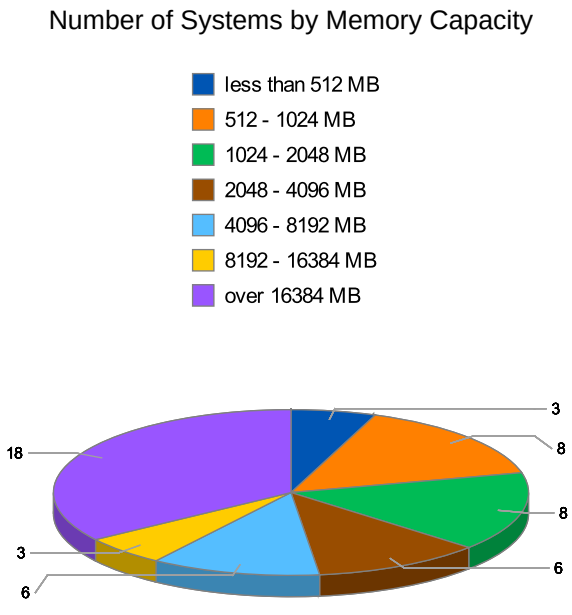
6.2.3 Processor Utilization Distribution

The average CPU utilization for the analyzed systems was 1.61% over the period of data collection.

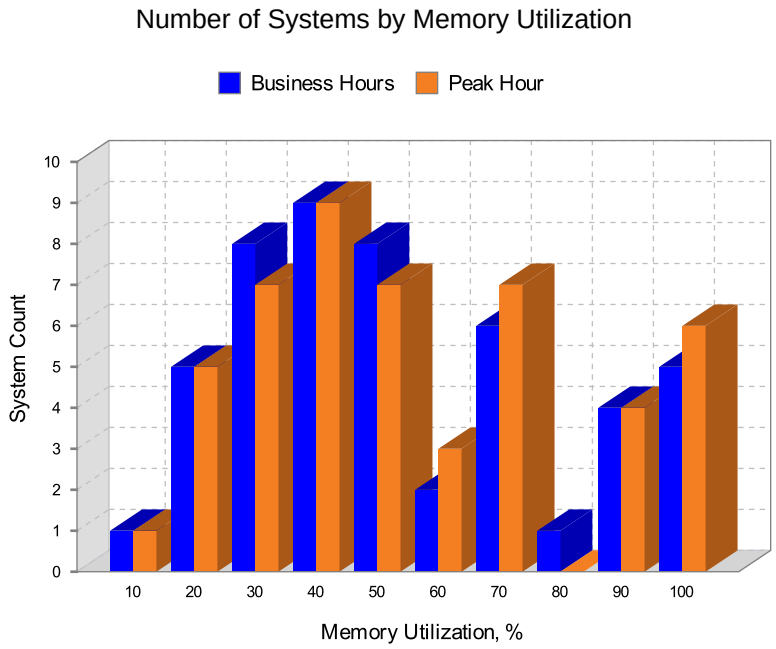


6.3 Memory Information

6.3.1 System Memory Capacity Distribution

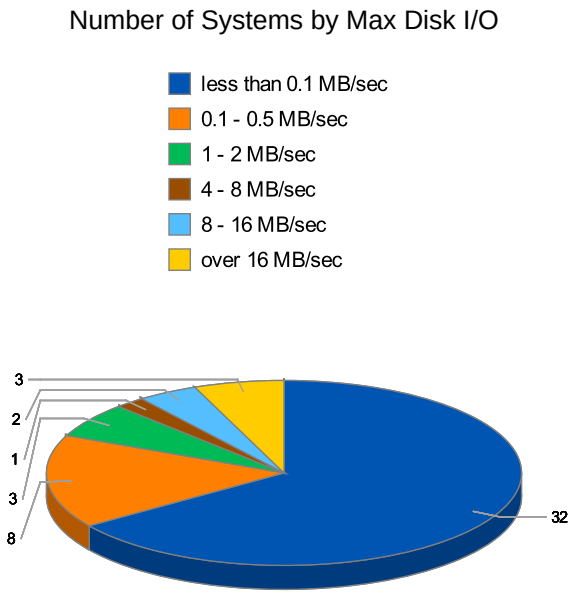


6.3.2 System Memory Utilization Distribution

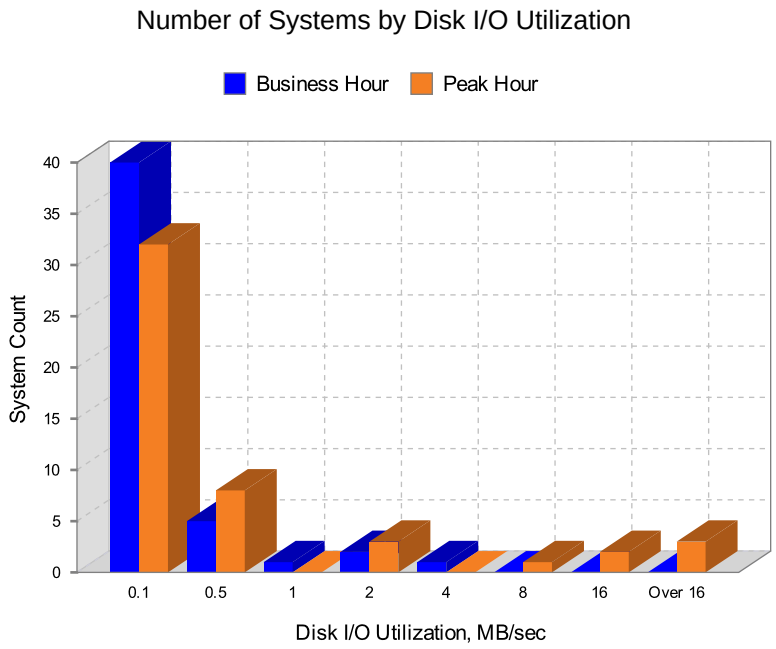


6.4 Disk I/O Information

6.4.1 System Disk I/O Max Observed Distribution

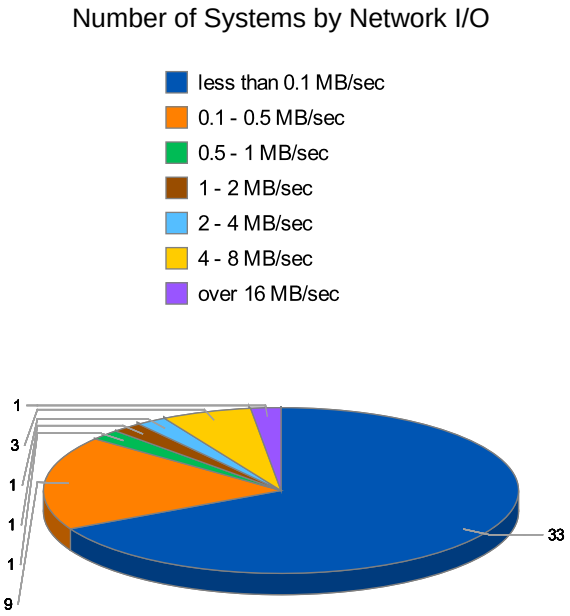


6.4.2 System Disk I/O Utilization Distribution

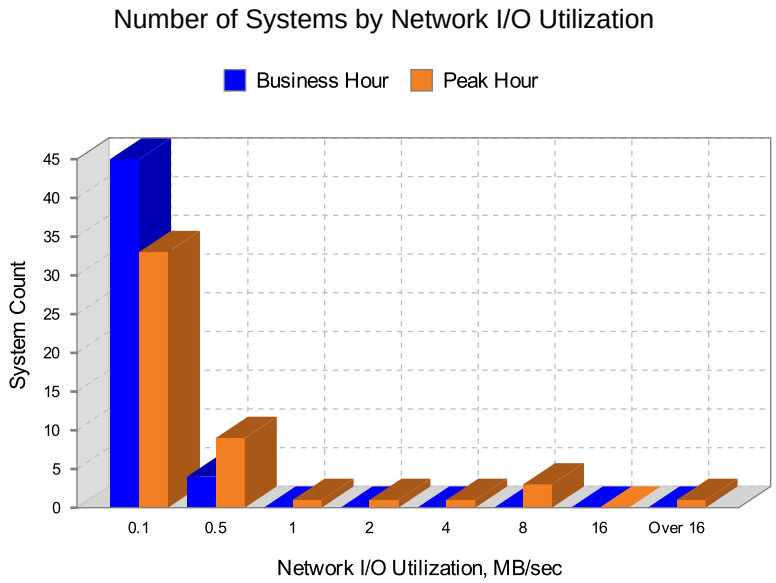


6.5 System Network Information

6.5.1 System Network I/O Distribution

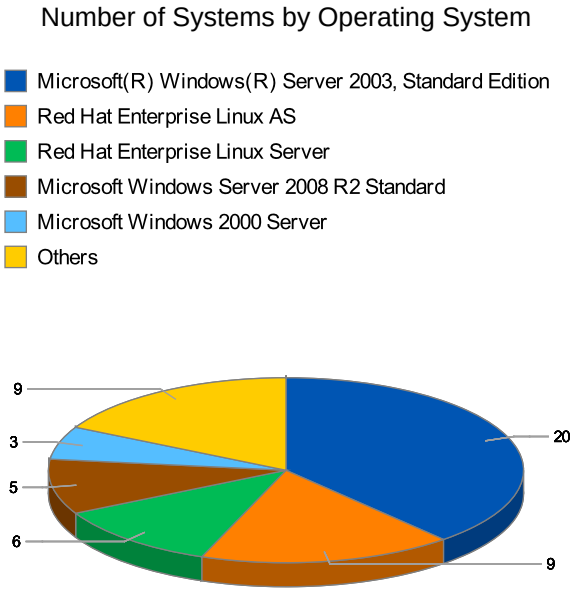


6.5.2 System Network I/O Utilization Distribution

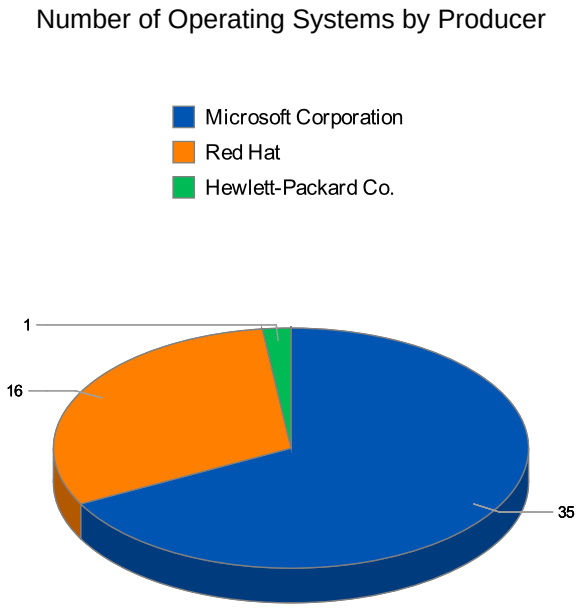


6.6 Operating System Information

6.6.1 Operating System Distribution



6.6.2 Operating System Type Distribution



6.7 Application Information

6.7.1 Installed Software

No approved or disapproved profiled applications are present

6.7.2 Applications Software

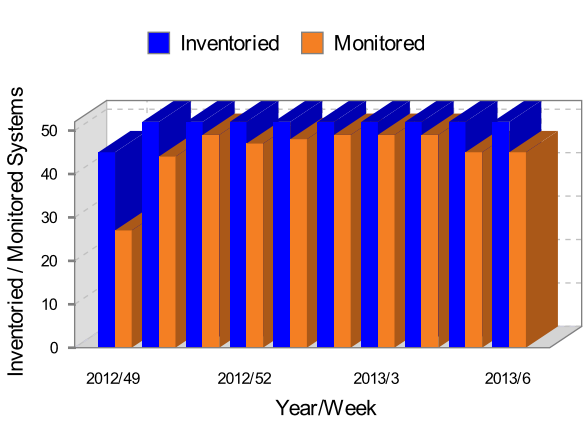
No profiled applications are present

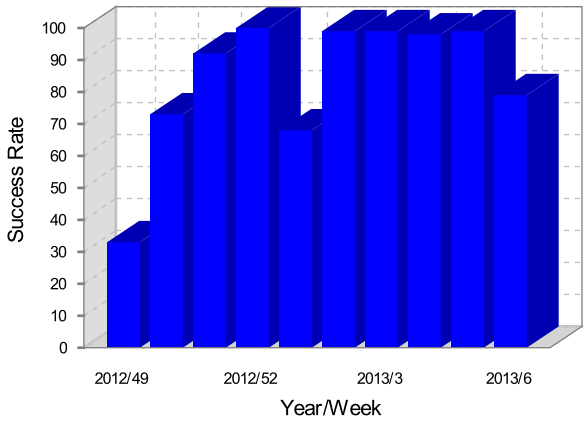
Section 7: Collection Results

7.1 Overview

VMware identified 52 systems to be analyzed in FDCCD. Of the 52 systems found, 49 had enough information to be analyzed. The systems were monitored for 70 days from the week of December 8, 2012, to the week of February 9, 2013.

Inventory and Performance Collection Summary





7.1.1 Collection Problem Description

The findings included in the report are based on the 49 analyzed systems. Any systems that had missing information are excluded from analysis. Missing information includes inventory data that describes the capacity of the source system and performance data that describes utilization of the source system. Both properties of a system are needed to perform proper analysis.

Table 1. Systems Analyzed

Name	System Population	Number	Reason for Exclusion
A	Original list provided by FDCCD	52	
B	No Data		VMware Capacity Planner unable to connect to system
C	Invalid Data		VMware Capacity Planner identified questionable anomalies (for example, CPU speed reporting as 3MHz)
D	Incomplete Data	(3)	VMware Capacity Planner did not obtain a complete sampling of data across the entire sampling period
E	Total Systems Analyzed	49	

7.1.2 Systems Summary

Table 1. Utilization Summary

Group	% CPU Utilization	CPU Queue	Disk Utilization		Pages Per Second	Network Bytes Per Second
			% Busy	Disk Queue		
Industry Average	4.61	0.69	3.69	1.43	122.17	119,911.75
All Systems Group	1.61	0.03	1.07	0.02	36.09	36,281.11

Section 8: Analysis Description

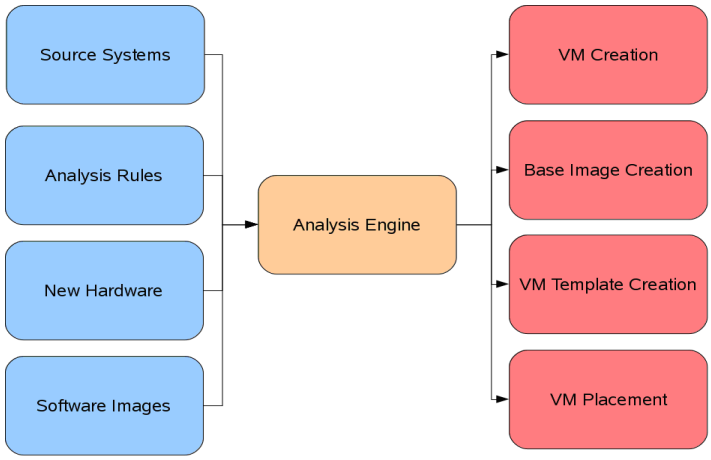
The analysis engine for VMware Capacity Planner performs a variety of analyses. Section 3 shows how the analysis engine is used to perform software usage analysis and user mapping to virtual machine template analysis.

This section presents a brief explanation of the inputs and outputs that the analysis engine uses to generate the reports.

8.1 Overview

VMware Capacity Planner has a robust analysis engine that combines source systems, analysis rules, new hardware, and software selection to formulate the best plan to create an optimum virtual environment.

The following diagram shows the conceptual inputs and outputs of the analysis engine.



8.2 Analysis Inputs

Analysis cannot happen without data to analyze and rules to guide the analysis. Capacity Planner uses the concept of scenarios to define these rules. Capacity Planner also performs extensive data collection of inventory and performance data to analyze.

8.2.1 Source Systems

Source systems have different capacity and utilization needs. Because the analysis involves moving loads capacity and utilization are required to normalize some of the utilization measurements into a transferable unit.

The % CPU utilization is a good example of a measurement that requires normalization. It is relative to the MHz capacity of the source system. It is not difficult to multiply the percentage of CPU to CPU MHz and get an absolute value. This calculation is only one of the normalization techniques that Capacity Planner uses. Although a CPU MHz is better than the percentage CPU, it is not quite a transferable unit of

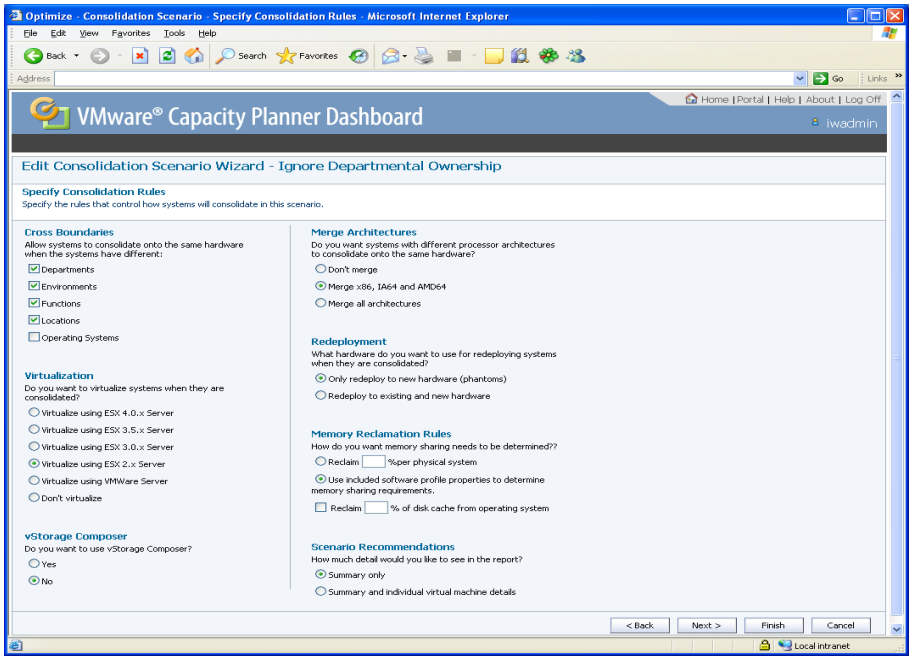
measure. A MHz is not the same on all CPU processors. The word length, cache size, core count, and pipeline length are examples of other processor properties that affect the performance different. Capacity Planner uses several properties to determine the proper transferable unit of measure.

8.2.2 Analysis Rules

Capacity Planner has many rules that can be applied to control analysis. The main categories of rules are:

- **Cross Boundaries** - Allows merging systems from different groups of the same group type. This rule allows you to perform "what-if" considerations, such as merging locations.
- **Virtualization** - Choose the virtualization platform that to use for the resultant plan.
- **Merge Architectures** - Allows control of processor family merging. This is good for performing "what-if" analysis to standardize on a processor family even from non-x86 platforms.
- **Redeployment** - Allows reusing hardware that was recently purchased for analysis. The hardware is reused in order of biggest platform to smallest. If the rules cause all the existing hardware to be consumed, new hardware is added as needed. A threshold for reusing hardware limits the usage of existing hardware even though the hardware may accommodate existing systems.
- **Maximum Load Thresholds** - Controls the maximum load for stacking systems together. Load is measured for every hour of the day, averaged across the week. The stacking considers the highest resultant hour load.

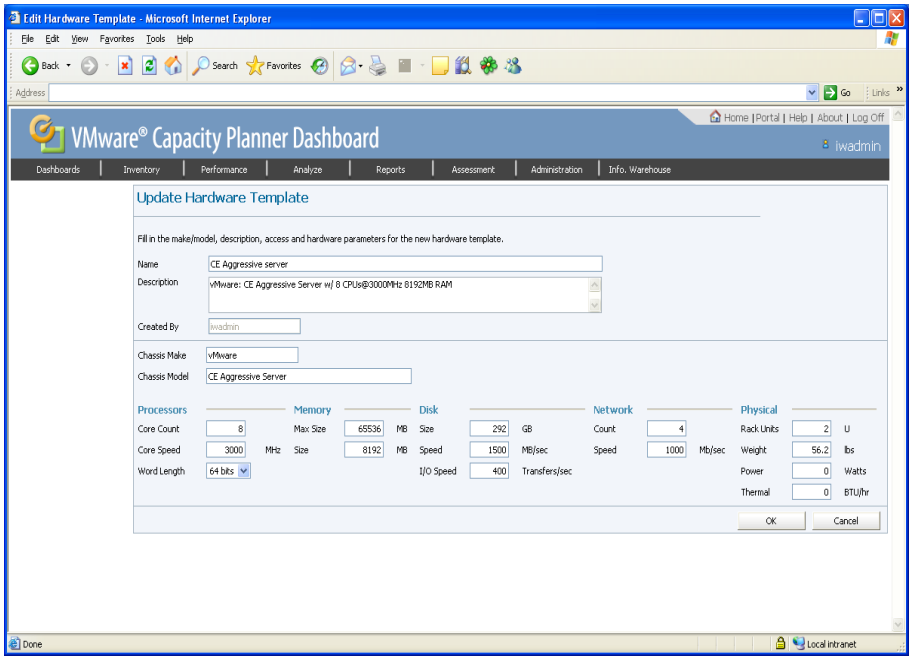
Below is an example screenshot of the analysis rules configuration screen in Capacity Planner.



8.2.3 New Hardware

Virtualization is best done with new hardware. The greatest consolidation can be realized by using a custom hardware configuration meant to be a host of several systems running as virtual machines.

Each scenario contains a link to a hardware platform template to use to create new ESX hosts. The hardware template can be specific to a vendor's hardware platform offering, or generic. All resource categories for the hardware platform are adjustable. CPU, memory, disk, and network resources are used during analysis as capacity. Power, cooling, and size are used for reporting the effect on the data center environment.



8.2.4 Software Images

Software profiles and images are used to perform application analysis as an added value to placing systems to a host. Capacity Planner refers to call the set of applications and the operating system that will be used to create the virtual machine templates.

8.3 Analysis Results

All the inputs that are provided to the analysis engine are used to create reports that help the customer solve virtualization questions. Moving to a virtual environment provides new management capabilities that require analysis. Many of the common questions are answered through VMware Capacity Planner reports.

The analysis results are described in Section 2.