

# Total Cost of Ownership Comparison of PCs With Server-Based Computing

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Server-based computing (SBC) is a mature client architecture that delivers substantial total cost of ownership (TCO) savings when it is implemented in the right circumstances and with the right group of users. We compare the TCO of SBC to that of traditional PCs in several scenarios to explain where the savings take place.

## Key Findings

- The TCO of an SBC deployment used to deliver all applications to users is around 50% lower than that of an unmanaged desktop deployment, and 11% to 18% lower than that of a locked and well-managed PC deployment.
- Direct costs of SBC are between 12% and 27% lower than those of traditional PCs.
- SBC deployments are particularly attractive when client devices are shared by multiple users – that is, when the number of concurrent users is lower than the total number of users – even compared with that of locked and well-managed desktop PCs.

## Recommendations

- Use TCO as one of the criteria to evaluate a client architecture, but don't base your decision solely on TCO considerations. Other aspects to consider include business continuity, regulatory compliance and security. The requirements of knowledge workers, power users or mobile workers may be best served by combining application delivery via SBC with another application delivery technique.
- Carefully estimate migration costs involved in moving to an SBC architecture. These costs are not included in our TCO numbers.
- Organizations that implement Citrix XenApp in addition to Windows Terminal Services (WTS) for larger, more-complex implementations typically see additional TCO savings.

## ANALYSIS

Many organizations periodically reassess their client-computing strategies and ask Gartner whether they should consider alternative client architectures. Our PC TCO research helps IT organizations understand how the overall costs of supporting existing PC deployments are likely affected by a client architecture change.

Previous Gartner research has shown that SBC represents a mature alternative to traditional PC-based configurations. When SBC can be applied to every application in use and, consequently, distributed PCs can be replaced by thin-client devices, significant TCO reductions can be delivered. Our updated TCO research confirms these findings. However, SBC is used by many organizations to distribute some applications to traditional PCs that have other

applications installed locally. We have created several scenarios to reflect the TCO implications of this and other types of deployments that we see more-frequently implemented among Gartner clients.

It is important to note that our TCO models do not necessarily reflect the reality of any particular IT organization. We encourage enterprises to perform their own analyses using our models to determine the site-specific impact of a particular change. Differences in end-user proficiency, installed-base size and implementation strategies can significantly affect an enterprise's costs.

### Assumptions

To compare TCO of PCs with that of SBC, we have created and compared several scenarios. The first four scenarios represent traditional PC deployments with different levels of management applied, as described in "Desktop Total Cost of Ownership: 2008 Update." In all scenarios, the assumptions are that there are 2,500 users and 2,500 PCs, a centralized IT organization, and only one large site. The salary levels used are for a relatively high-cost, mature market. Because we are trying to concentrate only on the differences between the scenarios, we will ignore application, file and print servers that typically exist in most environments. Other assumptions are documented in Table 1. The different levels of management applied are:

- **Wide open** – Users can install applications and change settings, with little to no management tools used.
- **Somewhat managed** – Some management tools are used, but they're light on process and policy.
- **Moderately managed** – Tools and good processes and policies are used, but users can install software and change at least some settings.
- **Locked down and well-managed** – Intense use of tools, with established processes and policies in place. Users are locked down and cannot install software or change critical settings.

The two SBC scenarios were built assuming the same number of users – 2,500 concurrent users – equipped with 2,500 thin-client devices, a small number of applications in use (eight) all delivered through SBC and 36 physical SBC servers priced at \$5,000 each, grouped in four server farms. In the first SBC scenario, applications are presented directly through WTS; in the second scenario, we assume that applications are presented through an add-on management solution, such as Citrix XenApp (previously Presentation Server), operating on top of WTS.

For SBC deployments, we assume the same user mix that we did in "Desktop Total Cost of Ownership: 2008 Update." This means that 74% of users are structured task users. It is less likely that knowledge workers or high-performance workers would use the SBC architecture unless there is a specific requirement for their task (for example, a high-security requirement). Because salary level is a key determining factor in our TCO model, and salary level differs depending on worker type, the TCO result will vary based on the makeup of a specific enterprise's end-user population. We encourage organizations to perform their own analysis using our models to determine the site-, salary- and end-user-specific impact of a particular change.

### What Is Not Included

It is important to clarify what is included in our TCO numbers. This research covers the TCO of SBC; the TCO of other alternative client architectures, such as blade-based PCs, or hosted virtual desktops are covered in other research.

Our TCO research generally does not include any migration costs, such as application testing, application redevelopment and other application-specific issues (such as reconfiguration) that may arise. These costs can vary substantially from one circumstance to another and should be estimated carefully to obtain a complete picture of the cost implications of moving to SBC. The model does not include costs related to network, business continuity, regulatory compliance management or virtual private network (VPN) infrastructure. Also excluded are costs for storing user data, as well as file and print servers.

Many organizations understand the TCO (and other) benefits that SBC offers. What prevents most organizations from wider adoption are issues related to the number of unique PC-based applications that exist in the organization. Furthermore, getting every application to run in an SBC environment is not a trivial exercise.

### TCO Analysis

A summary of TCO analysis for each model is shown in Figure 1. Overall, the SBC scenarios have a lower TCO compared with the well-managed and locked-down desktop model (an 11% reduction in SBC with WTS, and an 18% reduction in SBC with WTS and Citrix). The TCO difference is much greater when we compare SBC with the other desktop scenarios. The TCO of an SBC deployment is:

- 48% to 52% lower than that of our unmanaged desktop scenario
- 42% to 47% lower than that of the somewhat-managed desktop scenario
- 35% to 40% lower than that of the moderately managed desktop scenario

Figure 2 provides details of each cost item included in our model. Numbers are per users per year.

### Direct Costs

In the SBC WTS scenario, the overall cost for hardware, software and facilities are 10% to 16% lower than those for all PC scenarios. When an add-on product, such as Citrix XenApp, is used, these cost savings are partially offset. Hardware and hardware maintenance costs in both SBC scenarios are significantly (almost 70%) lower than in the PC scenarios. This is because we assume the use of less-expensive devices with a longer average life cycle (six years vs. four years for PCs). Software costs conversely increase as we account for the additional Microsoft Client Access Licenses (CALs) for terminal services and, in the second SBC scenario, for software license fees for the add-on management product, such as Citrix XenApp.

Figure 1. Desktop PCs vs. SBC: TCO Summary

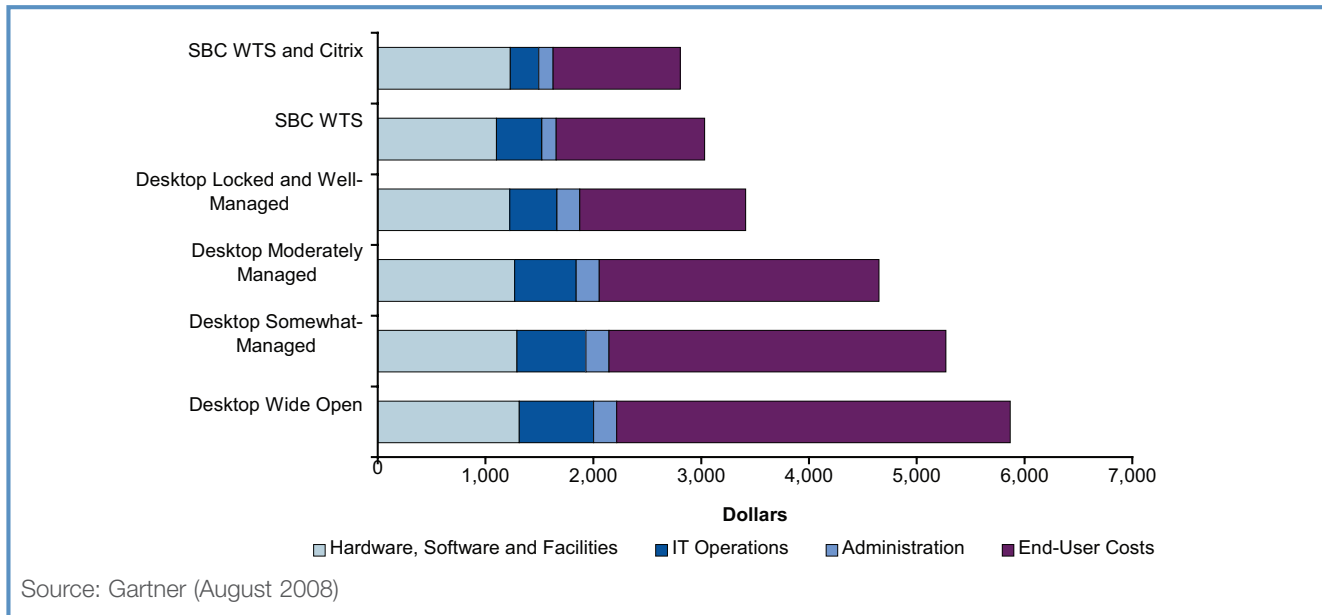


Table 1. TCO Scenario Assumptions

	Desktop – Unmanaged	Desktop – Somewhat-Managed	Desktop – Moderately Managed	Desktop – Locked and Well-Managed	SBC – WTS	SBC – WTS and Citrix
Users	2,500 users, 5% data entry, 74% structured task users, 20% knowledge workers and 1% power users	2,500 users, 5% data entry, 74% structured task users, 20% knowledge workers and 1% power users	2,500 users, 5% data entry, 74% structured task users, 20% knowledge workers and 1% power users	2,500 users, 5% data entry, 74% structured task users, 20% knowledge workers and 1% power users	2,500 users, 5% data entry, 74% structured task users, 20% knowledge workers and 1% power users	2,500 users, 5% data entry, 74% structured task users, 20% knowledge workers and 1% power users
Devices	2,500 PCs, price paid was \$1,200 – monitor included, with an expected life cycle of four years	2,500 PCs, price paid was \$1,200 – monitor included, with an expected life cycle of four years	2,500 PCs, price paid was \$1,200 – monitor included, with an expected life cycle of four years	2,500 PCs, price paid was \$1,200 – monitor included, with an expected life cycle of four years	2,500 thin clients, price paid was \$400 – monitor included, with an expected life cycle of six years	2,500 thin clients, price paid was \$400 – monitor included, with an expected life cycle of six years
Servers		Five management servers at \$2,000, each with an expected life cycle of four years	Five management servers at \$2,000, each with an expected life cycle of four years	Five management servers at \$2,000, each with an expected life cycle of four years	36 physical servers, at \$5,000 each, with an expected life cycle of four years	36 physical servers, at \$5,000 each, with an expected life cycle of four years
SBC Server Software					Windows Terminal Services	Windows Terminal Services and Citrix XenApp (Presentation Server)
Applications	250, 20% of which were thin or Web based	250, 20% of which were thin or Web based	250, 20% of which were thin or Web based	125, 20% of which were thin or Web based	Eight	Eight

Source: Gartner (August 2008)

Figure 2. TCO Comparison: Desktop PCs vs. SBC

	Desktop — Unmanaged	Desktop — Somewhat- Managed	Desktop — Moderately Managed	Desktop — Locked and Well- Managed	Server- Based Computing WTS	Server- Based Computing WTS and Citrix
Hardware	\$ 300	\$ 299	\$ 298	\$294	\$ 85	\$ 85
Hardware Maintenance	42	43	44	\$45	26	26
Software	750	725	699	\$648	762	820
Software Maintenance	150	150	150	\$150	153	223
IT Software	70	75	79	\$88	76	76
Data Center Allocation	-	-	-	\$0	1	1
<b>Hardware, Software and Facilities</b>	<b>\$ 1,312</b>	<b>\$ 1,293</b>	<b>\$ 1,271</b>	<b>\$1,226</b>	<b>\$ 1,102</b>	<b>\$ 1,230</b>
Tier 1	\$ 117	\$ 111	\$ 105	\$93	\$ 62	\$ 62
Tier 2	228	193	159	\$91	77	29
Tier 3	98	99	92	\$77	177	97
Security	97	90	81	\$64	46	46
Desktop Management	151	146	135	\$112	57	30
<b>IT Operations</b>	<b>\$ 690</b>	<b>\$ 639</b>	<b>\$ 572</b>	<b>\$438</b>	<b>\$ 420</b>	<b>\$ 263</b>
Administration	\$ 74	\$ 72	\$ 69	\$63	\$ 44	\$ 44
Management	68	68	68	\$68	47	47
User Training	30	31	32	\$35	34	34
IT Training	14	15	15	\$15	6	6
Disposal	30	30	30	\$30	2	2
<b>Administration</b>	<b>\$ 216</b>	<b>\$ 215</b>	<b>\$ 214</b>	<b>\$210</b>	<b>\$ 133</b>	<b>\$ 133</b>
Training	\$ 442	\$ 433	\$ 424	\$406	\$ 530	\$ 442
Fixing	3,019	2,539	2,059	\$1,099	719	625
Downtime	187	150	111	\$33	126	111
<b>End-User Costs</b>	<b>\$ 3,649</b>	<b>\$ 3,122</b>	<b>\$ 2,594</b>	<b>\$1,539</b>	<b>\$ 1,375</b>	<b>\$ 1,178</b>
Hardware and Software	\$ 1,312	\$ 1,293	\$ 1,271	\$1,226	\$ 1,102	\$ 1,230
IT Operations Labor	690	639	572	\$438	420	263
Administration Labor	216	215	214	\$210	133	133
<b>Direct Costs</b>	<b>\$ 2,218</b>	<b>\$ 2,147</b>	<b>\$ 2,056</b>	<b>\$1,874</b>	<b>\$ 1,655</b>	<b>\$ 1,627</b>
<b>End-User Costs</b>	<b>\$ 3,649</b>	<b>\$ 3,122</b>	<b>\$ 2,594</b>	<b>\$1,539</b>	<b>\$ 1,375</b>	<b>\$ 1,178</b>
<b>TCO</b>	<b>\$ 5,867</b>	<b>\$ 5,269</b>	<b>\$ 4,650</b>	<b>\$3,413</b>	<b>\$ 3,030</b>	<b>\$ 2,805</b>
<b>Savings Compared With Locked and Well-Managed Desktops</b>						
<b>Direct Cost Change (%)</b>					-12%	-13%
<b>End-User Cost Change (%)</b>					-11%	-23%
<b>TCO Change (%)</b>					-11%	-18%

Source: Gartner (August 2008)

In the IT operations category of costs, we observe a significant cost decline in all categories for SBC, with the sole exception of Tier 3 support, which is higher or similar to that of manually managed PCs. This is because most issues are likely to be advanced support problems concerning servers and the network. The number of full-time equivalents and the skill mix required is likely to change when an organization migrates to SBC. Although support requirements for Tier 1 and Tier 2 PC resolution and desktop management may decline, demand for server- and SBC-specific skills will increase. The use of add-on management SBC software can, however, reduce the server management overhead, thus reflecting positively on the number of full-time equivalents required.

Administration costs in the SBC scenarios decline by 37% compared with a well-managed PC scenario because of less-frequent hardware refresh cycles and less activity related to vendor and asset management.

The cost items that we have examined thus far (that is, hardware, software and facilities costs), the IT operations costs and the administration costs are all "direct costs" (or budgeted costs). Direct costs are often the only portion of TCO considered by many organizations. Table 2 shows the direct cost savings that can be obtained by moving from a thick PC deployment to SBC. They are considerable, and range between 27% and 12%, depending on how well-managed the PC deployment is, but they are less than the overall TCO savings described above.

**Table 2. Direct Cost Savings**

	Desktop – Unmanaged	Desktop – Somewhat-Managed	Desktop – Moderately Managed	Desktop – Locked and Well-Managed	SBC – WTS	SBC – WTS and Citrix
Direct Costs	\$2,218	\$2,147	\$2,056	\$1,874	\$1,655	\$1,627
Cost Savings of SBC WTS	-25%	-23%	-20%	-12%		
Cost Savings of SBC WTS and Citrix	-27%	-24%	-21%	-13%		

Source: Gartner (August 2008)

A subset of direct costs that receives further scrutiny is capital costs (that is, costs associated with hardware/software acquisitions). For many organizations, capital costs tend to be about the same for desktops and those that implement SBC. Our numbers confirm that capital cost savings of SBC environments range between 6% and 16%.

### Indirect Costs

Indirect costs, or end-user costs, are costs that do not appear in the IT budget. End-user costs account for the lost productivity of users who are learning about their systems, or are doing IT-related tasks without relying on formal support channels. They can also be due to downtime. Reducing end-user costs means freeing up resources that can be used productively elsewhere. Overall, end-user costs in both SBC deployments decrease substantially compared with a locked-down and well-managed PC deployment (11% reduction and 23%, respectively). User-training costs are likely to increase in the SBC WTS scenario because the experience changes and users need to acquire familiarity with the new environment. This is less of an issue in SBC deployments that use add-on products, such as Citrix XenApp, where the user transition is typically smoother because of the use of seamless windows. However, the time spent by users in fixing their own or peers' PC-related problems decrease substantially in an SBC scenario, even compared with a well-managed and locked-down PC scenario. This is because thin-client devices are less likely to fail, and also because problems related to users modifying settings or system images are eradicated with SBC. Costs due to downtime are much higher than those incurred in well-managed PC scenarios. This is because of the inherent server and network dependence of SBC.

In Figure 3, we compare typical scenarios for desktop PCs, which usually involve a complex application mix, with an SBC deployment where a small set of applications are all delivered from the server to thin-client devices. Table 4 describes a similar comparison, where in the desktop PC and the SBC scenarios, we have eight applications in use in all scenarios. We also have a user mix (20% data entry users; 80% task-oriented users) that is more typical of SBC deployments, where all applications in use reside

on the server. Overall TCO savings against the unmanaged desktop scenario remain substantial (in the range of 40% to 44%). Compared with the locked and well-managed desktop scenario, SBC delivers 4% to 10% savings.

### Other Scenarios

Here, we describe some other scenarios that we often see implemented by Gartner clients.

### Number of Concurrent Users Lower Than Total Number of Users

In this scenario, we have an SBC deployment with WTS, and an add-on management product, but this time we assume that the organization has 7,500 users overall, and only around 2,500 users will use their client devices and access applications concurrently. All other assumptions about applications, servers and client infrastructure are unchanged. The desktop deployment assumes the same user-to-device ratio, the same number of applications, and is locked-down and well managed. Figure 4 shows how the TCO per user (not per device) is substantially reduced, making this option particularly attractive in given deployment scenarios, such as call centers.

### Simple Deployments

In the case of smaller-scale SBC deployments, where the number of users involved, the number and type of applications in use, the number of locations, and so forth is more modest, the use of an add-on management product may add to direct costs without delivering all the benefits that it offers in more-complex/large-scale situations. We have simulated a scenario with 300 users and 300 thin clients, six servers, and seven applications in use. Figure 5 shows that, although the use of add-on management SBC software still delivers a slightly lower overall TCO (a reduction of 3%), it increases direct costs by 7%.

Figure 3. TCO Comparison of Desktop PCs and SBC Deployments Using Eight Applications

	Desktop — Unamanged	Desktop — Locked and Well- Managed	Server- Based Computing WTS	Server- Based Computing WTS and Citrix
Hardware	\$ 300	\$ 301	\$ 85	\$ 85
Hardware Maintenance	42	45	26	26
Software	750	648	762	820
Software Maintenance	150	150	153	223
IT Software	70	88	76	76
Data Center Allocation	-	-	1	1
<b>Hardware, Software and Facilities</b>	<b>\$ 1,312</b>	<b>\$ 1,226</b>	<b>\$ 1,102</b>	<b>\$ 1,230</b>
Tier 1	\$ 78	\$ 62	\$ 62	\$ 62
Tier 2	152	61	77	29
Tier 3	66	54	177	97
Security	65	43	46	46
Desktop Management	100	121	57	30
<b>IT Operations</b>	<b>\$ 461</b>	<b>\$ 341</b>	<b>\$ 420</b>	<b>\$ 263</b>
Administration	\$ 50	\$ 42	\$ 44	\$ 44
Management	45	45	47	47
User Training	20	23	34	34
IT Training	14	15	6	6
Disposal	30	30	2	2
<b>Administration</b>	<b>\$ 159</b>	<b>\$ 155</b>	<b>\$ 133</b>	<b>\$ 133</b>
Training	\$ 331	\$ 304	\$ 418	\$ 348
Fixing	2,180	794	567	493
Downtime	144	26	104	91
<b>End-User Costs</b>	<b>\$ 2,655</b>	<b>\$ 1,123</b>	<b>\$ 1,089</b>	<b>\$ 932</b>
		\$ -		
Hardware and Software	\$ 1,312	\$ 1,226	\$ 1,102	\$ 1,230
IT Operations Labor	461	341	420	263
Administration Labor	159	155	133	133
<b>Direct Costs</b>	<b>\$ 1,931</b>	<b>\$ 1,722</b>	<b>\$ 1,655</b>	<b>\$ 1,627</b>
<b>End-User Costs</b>	<b>\$ 2,655</b>	<b>\$ 1,123</b>	<b>\$ 1,089</b>	<b>\$ 932</b>
<b>TCO</b>	<b>\$ 4,586</b>	<b>\$ 2,845</b>	<b>\$ 2,743</b>	<b>\$ 2,559</b>
<b>Savings Compared With Locked and Well-Managed Desktops</b>				
<b>Direct Cost Change (%)</b>			-4%	-6%
<b>End-User Cost Change (%)</b>			-3%	-17%
<b>TCO Change (%)</b>			-4%	-10%

Source: Gartner (August 2008)

### Hybrid PC – SBC Scenario

All the scenarios described assume the exclusive use of thin-client devices for SBC. The reality, however, is that, in many circumstances, organizations will use PCs as client devices in their SBC deployments. When no applications are installed locally and PCs are configured effectively as thin clients, organizations will still enjoy similar TCO savings to those exclusively using thin clients. However, many organizations use SBC to deliver some applications to users, while other applications reside locally on the PC. Figure 6 illustrates this type of deployment with a scenario of 2,500 users, 2,500 unmanaged desktops and 250 applications in use, half of which are delivered through SBC using an add-on

management product. In the second column, we describe the cost relative to the PCs; in the third column, we outline the cost per user relative to the server and software infrastructure required to deliver 50% of the applications through SBC. This scenario delivers 3% TCO savings compared with an unmanaged TCO scenario. These savings take place in IT operations (a reduction of 15%), administration (a reduction of 10%) and end-user costs (a reduction of 5%).

Figure 4. SBCTCO With 3:1 Concurrency Ratio

	SBS	Locked and Well-Managed Desktops
Hardware and Software	\$ 382	\$ 412
IT Operations Labor	183	293
Administration Labor	104	137
<b>Direct Costs</b>	<b>\$ 669</b>	<b>\$ 842</b>
<b>End-User Costs</b>	<b>\$ 1,083</b>	<b>\$ 1,324</b>
<b>TCO</b>	<b>\$ 1,752</b>	<b>\$ 2,165</b>

Source: Gartner (August 2008)

Figure 5. SBCTCO – Simple Deployment

	SBC With WTS	SBC With WTS and Citrix
Hardware and Software	\$ 1,102	\$ 1,231
IT Operations Labor	399	387
Administration Labor	149	149
<b>Direct Costs</b>	<b>\$ 1,650</b>	<b>\$ 1,767</b>
<b>End-User Costs</b>	<b>\$ 1,385</b>	<b>\$ 1,185</b>
<b>TCO</b>	<b>\$ 3,035</b>	<b>\$ 2,953</b>

Source: Gartner (August 2008)

Figure 3. TCO Comparison of Desktop PCs and SBC Deployments Using Eight Applications

	PC Costs		Server Costs		Total	Unmanaged Desktop PC
Hardware	\$ 300	\$ 18	\$ 318	\$ 300		
Hardware Maintenance	42	2	44	42		
Software	750	99	849	750		
Software Maintenance	150	20	170	150		
IT Software	70	6	76	70		
Data Center Allocation	-	1	1	-		
<b>Hardware, Software and Facilities</b>	<b>\$ 1,312</b>	<b>\$ 146</b>	<b>\$ 1,459</b>	<b>\$ 1,312</b>		
Tier 1	\$ 95	\$ -	\$ 95	\$ 117		
Tier 2	185	-	185	228		
Tier 3	80	7	87	98		
Security	79	2	81	97		
Desktop Management	122	12	134	151		
<b>IT Operations</b>	<b>\$ 561</b>	<b>\$ 21</b>	<b>\$ 582</b>	<b>\$ 690</b>		
Administration	\$ 60	\$ 1	\$ 61	\$ 74		
Management	55	0	55	68		
User Training	24	-	24	30		
IT Training	14	11	25	14		
Disposal	30	(2)	28	30		
<b>Administration</b>	<b>\$ 184</b>	<b>\$ 10</b>	<b>\$ 194</b>	<b>\$ 216</b>		
Training	\$ 425	\$ -	\$ 425	\$ 442		
Fixing	2,831	-	2,831	3,019		
Downtime	184	19	203	187		
<b>End-User Costs</b>	<b>\$ 3,440</b>	<b>\$ 19</b>	<b>\$ 3,459</b>	<b>\$ 3,649</b>		
Hardware and Software	\$ 1,312	\$ 146	\$ 1,459	\$ 1,312		
IT Operations Labor	561	21	582	690		
Administration Labor	184	10	194	216		
<b>Direct Costs</b>	<b>\$ 2,057</b>	<b>\$ 178</b>	<b>\$ 2,234</b>	<b>\$ 2,218</b>		
<b>End-User Costs</b>	<b>\$ 3,440</b>	<b>\$ 19</b>	<b>\$ 3,459</b>	<b>\$ 3,649</b>		
<b>TCO</b>	<b>\$ 5,497</b>	<b>\$ 196</b>	<b>\$ 5,693</b>	<b>\$ 5,867</b>		

Source: Gartner (August 2008)