

## IT@Intel Brief

Intel Information Technology  
Computer Manufacturing  
Disaster Recovery

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# Establishing a Low-cost Disaster Recovery Site

Intel IT developed a cost-effective disaster recovery (DR) strategy for one of our data centers in Israel that has a potential business value of more than USD 3 million. During its first disaster recovery drill, the new site performed at nearly 100 percent.

DR sites are often perceived as a very expensive insurance policy—but we have found ways to make DR more affordable. As part of a microprocessor design project, we built a site that protected thousands of servers and hundreds of Terabytes of data. To optimize capital investments, we designed our solution to avoid idle compute servers, use a tiered storage system, and offload backup from the main data center, shown in Figure 1.

In our first total-loss disaster drill, we succeeded in bringing up 95 percent of services, according to their respective recovery point objectives (RPOs). When not in a disaster scenario, we are maximizing the value of our DR computing assets through high utilization rates.

### Profile: Disaster Recovery

- More than USD 2.5 million in capital expenditure avoidance.
- USD 250,000 in savings through implementing a tiered storage solution.
- Additional savings of USD 350,000 through offloading backup to DR site.

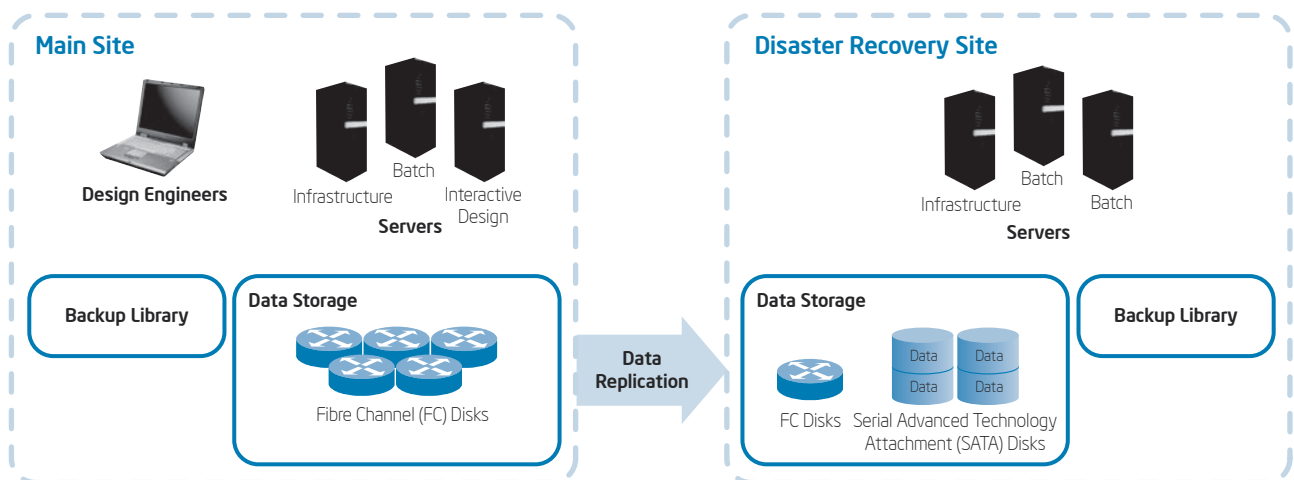


Figure 1. Intel IT achieves significant savings by using disaster recovery (DR) servers to run batch jobs, by storing DR data on low-cost SATA disks, and by offloading backup services to the DR site.

## Meeting the Challenge of Business Continuity

Business continuity is essential for any enterprise. The trend toward data center consolidation compounds the challenges of being disaster-ready because it has substantially increased the impact of losing a data center to unforeseen circumstances. Tight IT budgets make it impractical to maintain a standard DR plan that includes idle computing resources at the DR site.

As part of one of Intel's critical microprocessor design projects, top management gave Intel IT permission to construct a cost-effective DR site in Israel. We knew minimizing costs would be challenging, as the microprocessor project required thousands of servers and hundreds of Terabytes of data.

## Designing a Disaster Recovery Strategy

When designing and implementing the new DR site, we kept the following goals in mind:

- Invest in the correct type of equipment.
- Achieve the highest possible asset utilization rates.
- Keep costs as low as possible.

Figure 2 outlines our design process. After engaging management support, we moved to the service inventory phase in the planning lifecycle, which involved developing a list of required services for our solution. To minimize complexity and capital investments, we focused on protecting areas critical to the microprocessor project over the following year.

After meeting with Intel design engineers, we developed a complete list of services. Each service had a defined RPO—the point in time to which application data must be recovered to resume business transactions—and a defined recovery time objective (RTO)—the maximum elapsed time required to complete recovery of the application.

Our meetings with design engineers also gave us insight into their computing work models.

**Interactive work.** Engineers use remote-control software installed on their laptops to view and fully interact with servers residing in data centers. These graphic-intensive sessions require very low network latency—less than 5 milliseconds—between the laptops and the servers in the data center.

**Batch work.** Engineers run batch simulation jobs against pools of servers residing in data centers. Most of these jobs can run remotely on any available server worldwide in the Intel network. We use in-house job-scheduling software to land these jobs.

To accommodate these needs, our DR data center had three key requirements:

- Meet the engineer's latency requirements but reside far enough away from the main data center to mitigate the risk that a disaster might impact both the main site and the recovery site.
- Host enough compute servers to address engineers' interactive session needs.
- Host enough compute servers to run batch jobs that cannot run remotely at other Intel data centers.

After completing the service inventory, we were ready to choose, test, and implement solutions, and document our approach.

## Implementing the DR Site

Our low-cost DR approach is based on three main premises:

**Avoid idle compute resources.** After calculating the number of servers needed to host critical interactive sessions, local batch jobs, and additional infrastructure servers, we relocated batch servers from the main site to the DR site.

Relocating servers allowed us to avoid approximately USD 2.5 million in server purchases and also helped ensure that servers in the DR site have high utilization rates running batch jobs on a daily basis.

If a disaster occurs at the main site, the DR servers can be removed from the batch pool and used for their DR purpose.

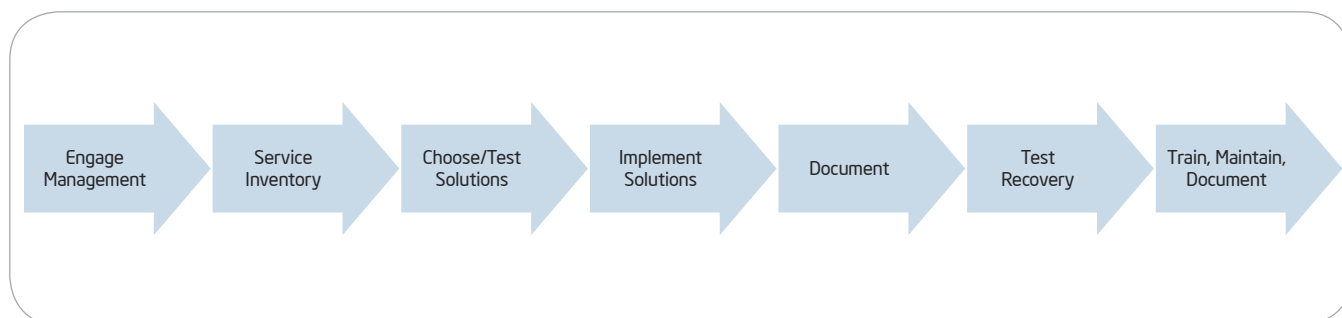


Figure 2. Developing a disaster recovery plan involves many steps.

**Use a tiered storage solution.** We matched data replication mechanisms to the engineers' RPO and RTO definitions. Also, to reduce storage costs, we implemented a tiered data storage solution using a combination of Fibre Channel (FC) and Serial Advanced Technology Attachment (SATA) disks.

- FC disks—about 20 percent of total DR site storage capacity—are used for I/O-intensive loads, such as those resulting from batch jobs.
- SATA disks—about 80 percent of total DR site storage capacity—are used for data that would only be required for interactive work in case of disaster.

Although SATA disk performance is lower than FC disk performance, our tests, conducted with design engineers, proved that the throughput is acceptable for a DR scenario.

By investing in low-cost SATA storage instead of more costly FC disks, we estimated a savings of more than USD 250,000.

**Offload main site backup.** Although a backup library is required at the DR site, we wanted to avoid investing in a new library and the associated drives and tapes that would be used only in case of a disaster and would sit idle the rest of the time. Our solution was to offload backup from the main site to the DR site. As part of our disaster-recovery efforts, data was already being replicated daily to the DR site. Instead of backing up data at the main site, we used the DR site's replicated data to create the backup copy.

Because we simply relocated a backup tape library from the main site to the DR site, we did not need to purchase an additional backup library for the DR site. This strategy saved Intel about USD 350,000.

Table 1 summarizes some of the ways in which our DR strategy met our goals.

## Results

Once we implemented the disaster recovery site, we were ready to use it to test recovery. Our low-cost DR site was successful, providing reliable data recovery and compute resources to Intel design engineers.

### Testing Recovery

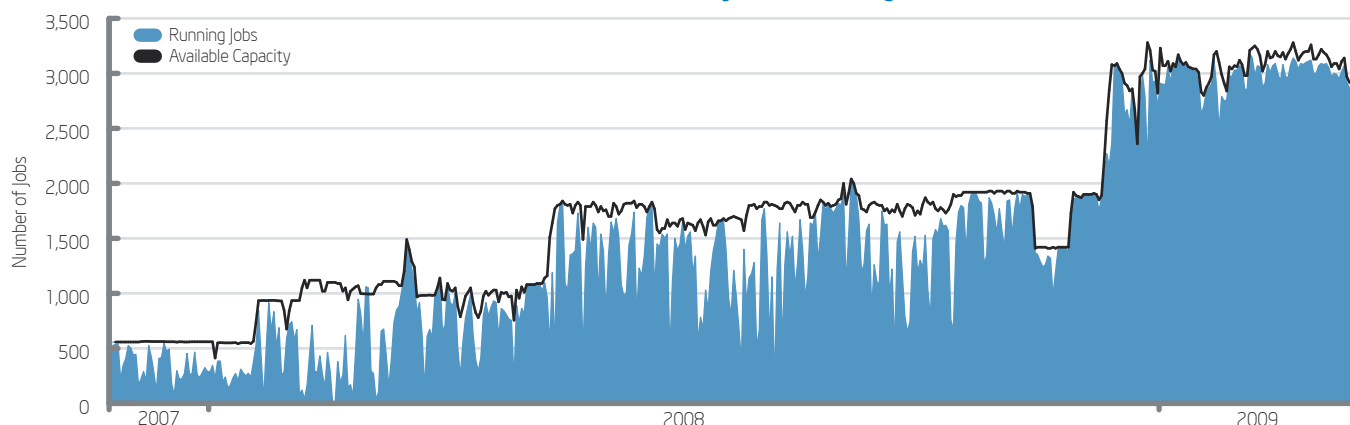
In July 2008, we conducted a total-loss disaster drill in our DR data center with Intel design engineers. We succeeded in bringing up 95 percent of the services, according to their respective RPO definitions.

During the drill, we simulated the main site being down by completely eliminating network connectivity between the DR site and the main site for about 24 hours. A team of IT staff and microprocessor design engineers relocated to the DR site and brought up the DR environment,

**Table 1. Disaster Recovery Strategies**

Resource	Strategy
Data center	For our disaster recovery (DR) site, we leveraged an existing Intel data center.  Instead of building a new facility from the ground up, we simply allocated extra floor space, network, and power and cooling capacity at the existing remote data center.
Servers	We use DR servers on a daily basis to run batch jobs, instead of purchasing servers and letting them sit completely idle at the DR site, waiting for a disaster to happen.
Storage	About 80 percent of the data resides on low-cost Serial Advanced Technology Attachment (SATA) storage disks; only about 20 percent resides on more expensive high-speed Fibre Channel (FC) disks.
Backup library	We use the DR backup library to back up replicated data from the main site, instead of buying an additional backup library that would sit idle at the DR site until a disaster occurred.
Network	To support the DR site's network load, mainly due to data replication from the main site, we added a 155-Mbps WAN line between the main data center and the DR site.

### Disaster Recovery Batch Pool Usage



**Figure 3. We invested intensive effort to make sure servers landing in the disaster recovery site are highly utilized running batch jobs, reaching near 100 percent utilization.**

following the documented plans for each of the services. Microprocessor design engineers tested applications and flows once they were brought up and partnered with us to troubleshoot where required. Not only was the drill very successful, but it taught us a lot about the recovery process.

### Server Utilization

When not in a disaster scenario, we are maximizing the value of our DR computing assets through high utilization rates, as shown in Figure 3.

### Future Challenges and Opportunities

Creating a DR solution is an ongoing effort; we are committed to keeping in close communication with microprocessor design engineers to redefine and reprioritize requirements as the project advances through its different stages.

We found that we need to streamline provisioning processes for data and services, so that new critical services and data are always available at the DR site, while obsolete ones are systematically removed.

We also need to strictly monitor data replication, because failure to copy data to the DR site not only impacts the ability to provide adequate response in case of disaster, but can also hinder the ability to recover data from tapes on a daily basis since the DR backup library is used to back up production data.

Although other organizations at Intel employ working models different from those of the microprocessor design group, our low-cost DR concept can be leveraged for different business scenarios:

- Software development teams usually host identical integration and production computing environments. In this case, we could move the integration environment to the DR site and, in case of disaster at the main site, convert the integration environment to production.
- For organizations already using site co-located clustering for their most mission-critical business applications, migrating to geographically resilient clusters might be a cost-effective solution.

We will continue to train staff and maintain and document our project in order to provide cost-effective DR solutions to Intel.

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