



**Don't break it!  
We've only just built it**

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## A Unique Opportunity

It's late on a Friday evening. You could be, and probably should be, enjoying the evening with friends or family. Starting to unwind from the week just gone. But, this week, this Friday, that's not quite where you are. Your standing in a data centre, trying to break it, and sometimes, possibly, getting a little closer than you expected.

OK, maybe you're not quite *trying* to break it, but you are pushing it to its extremes of design. Breaking it, is not the objective here; checking that it doesn't fail is.

This is the Integrated Systems Test (IST). The point in time for a project where everything is complete, everything is commissioned and tested, and everything is ready to be put to work. Critically though, no-one has yet moved in.

The IST suffers greatly from it being the last thing which can happen for a project; when the IST is happening, it is often the *only* thing between a client and their brand new, state-of-the-art, data centre. A data centre which has often been the product of many months of planning. Because of this, there is often pressure for this to take as little time as possible and to not delay the IT fit out any more than the absolute minimum – hence the late Friday session. Another view however, is that this is possibly the one and only time you will have to test the systems which you will be relying on so heavily in the years to come – especially as thoroughly and rigorously as you would like to.

It's also the time when you can start to get a feel of how the system will operate in terms of efficiency and performance at conditions you may never get another chance to simulate.

Understanding the systems allows those operating the facility to make good operational decisions over the whole life of the facility, based on proven experience rather than theoretical understanding. Quantifying the resulting performance advantages, efficiency gains, and cost reductions is impossible, let alone the impact of reduced risk.

In my view, the more you understand the IST, the less it feels like a barrier between the end user being able to populate the data centre, and the more it becomes an essential interactive part of the handover process



## Demonstrating Success

Of course, as a data centre designer and engineer, I am possibly slightly biased. The IST is the part of the project for our team where we know we have done our job properly *and* when we can prove it.

Naturally, with all projects there may be one or two things which may need some fine tuning but overall the IST should not raise anything new. Remember, everything should already have been commissioned and tested extensively.

Where the IST is different is that it covers all elements of the system, all working together, exactly as they would do.

The tests and demonstrations which are included within the final IST script will depend on the facility. There will always be basic functionality demonstrations; Total mains failure, Failures of individual items of plant etc. There may also be more extended demonstrations included in the script specific to how this facility is designed to operate.

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*"If the facility is designed to be fully maintainable without downtime, demonstrate it."*

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If the facility is designed to be fully maintainable without downtime, demonstrate it. If the facility is designed to be able to ride through a mains failure without interrupting the cooling system, then demonstrate that. This is, for all intents and purposes, a dry run for those worst case scenarios and therefore a great opportunity for those who will be expected to operate the facility to get involved.

All designs and all systems have strengths and weaknesses. Due to the mission critical nature of a data centre, as designers, we have a responsibility to ensure that, even at its weakest point, the system is always able to deliver.

When planning the IST, the focus naturally falls on simulating these weak points and ensuring that everything is still able to perform. This part of the IST is fundamental to having the confidence that the facility will operate correctly when the times get tough.

However, this doesn't mean we should pass on the opportunity to find where the facilities strengths are, and what we can do to ensure that, during the vast majority of normal days the facility will experience, the systems operate in the most efficient and effective manner.

How will the facility operate if we install a High Density cluster in the furthest corner from the cooling system? If the facility has been designed with this in mind, then the everything will be fine, but not necessarily optimum. This then poses the question - if we do have a High Density Cluster, where actually is best to locate it?

What about part-load? Does the facility operate the best it can do with the load it has across the curve? Or is there a point where things seem to be *unnecessarily* inefficient?

These additional tests are of course optional, but your unlikely to have another opportunity to do them so it's best to seriously consider if there is any test, demonstration or experiment which will be of value to you moving forward.

## A data centre without servers?

The opportunity we have for an extensive IST is only provided by the fact that the facility is not actually live and generally no IT hardware has been installed yet. The unfortunate side of this is that we now need to simulate the load which will be installed and the options we have are wide ranging in cost and suitability.

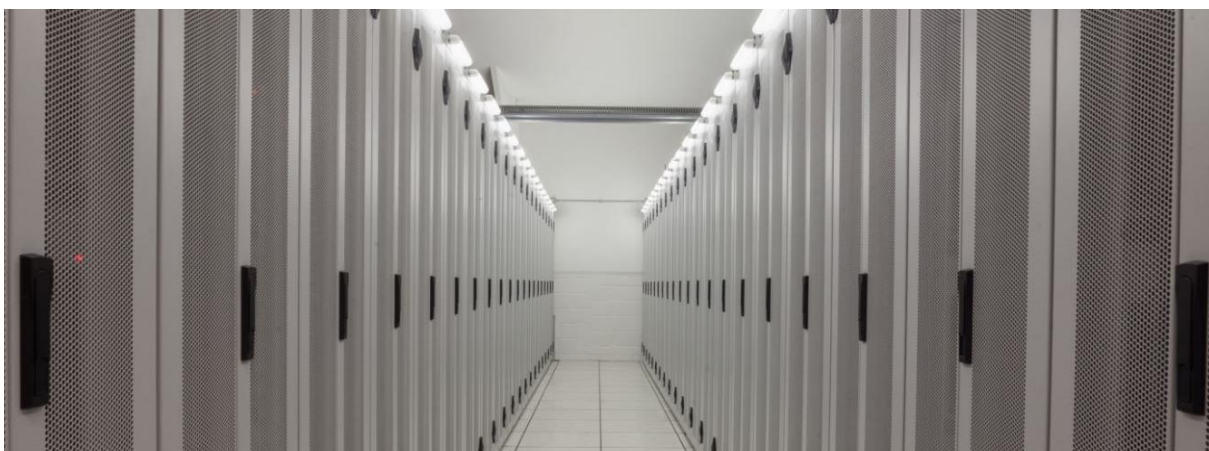
Larger load banks can be installed for a fairly low cost, but the chances are that the final distribution will not be suitable for such large single feeds, resulting in temporary distribution, and the temperature and flow profile from these doesn't really replicate that of a server. But they are a low cost and a quick solution.

Alternatively, smaller rack mounted load banks are a great option for many applications. Depending on the final distribution which is available they can be fairly quick to install but usually you still need to consider the temperature and flow profile.

With both solutions, you are generally limited to testing a single path at a time. Again, for many applications this is more than adequate but you won't see that full load transfer that occurs if you lose a single side of your power distribution.

For me, an ideal solution is a system with a variable temperature profile, being able to deliver the full load with a temperature increase of 10-12°C, and which is also able to simulate dual corded IT in terms of a rapid load transfer. And if we can remotely manage the load and temperature the possibility and practicality of some of the more advanced tests grows exponentially. Sudlows' research & development team have spent a lot of time on solving this technical need and have just completed the final testing on our new Advanced Load IST rack, or to give its slightly more memorable name, "A-LIST".

Sometimes our options may be limited by the facility design itself but, ultimately, how we simulate the final IT systems will in turn limit the tests which can be undertaken or the usefulness of the results so it's all a matter of balance.





## Who's IST is it anyway?

Is the IST for the contractor, the consultant, or the client? In my opinion, the IST is such an important part of both the construction and ongoing operation of a data centre that it spans many stakeholders and roles. It's the end of the construction project and the start of a live data centre.

Perhaps this is something which you have done many times before, or perhaps this is something you never really considered?

If it's more of the latter, and you're unsure of what's going to be right for you and your project when the time comes, then starting to think about this early is going to be an advantage rather than trying to squeeze it in late.

If, like me, you see the importance of this critical exercise, then there is no reason why the specification of what you want to see, and how you want to see it should get any less attention than the components of the data centre itself. Incorporating your expectations of the IST into a requirements specification ensures that this opportunity does not get overlooked, and rather than a begrudgingly undertaken exercise, it is instead embraced as the real opportunity that it is.

So after this, if you find yourself one Friday evening, rigorously testing a data centre before the IT fit out is due to commence on the Monday, you will know that it has all been worth it. I guarantee it will not only leave you with a valuable understanding of how everything will work when everything else is going wrong, but with an additional level of confidence and experience which you just couldn't have gained without being there.



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