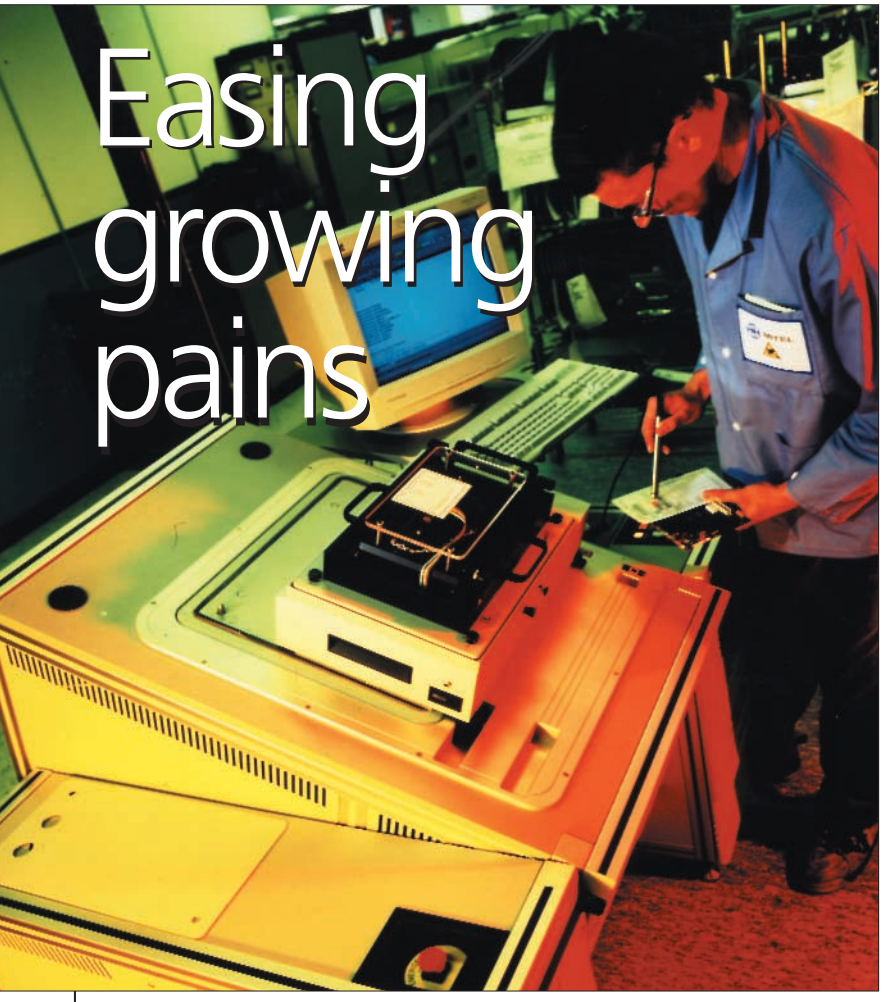
Easing growing pains



Growing by acquisition creates a challenging test environment for telecomms specialist Mitel. It regularly has to migrate products from companies with incompatible CAD tools and production testers, which played a key role when choosing a new ATE – as Jim Davies of Mitel Business Communications explains.

When Mitel bought ISDN specialist Telecom Sciences (TSc) of Airdrie in Scotland, in May 1998, as part of its growth-by-acquisition strategy, it meant that the company had to make 25 new boards – each with a number of variants – at its Caldicot factory in Wales. And the original deadline set for transferring production was March 1999.

At the time of the acquisition, Mitel used Fairchild 303/333 in-circuit testers – installed in the early 1980s. Good boards were integrated into a system, which was then functionally tested before shipment. The Fairchilds had served the company well, but it was already clear that test times were too long. Support and spares were also becoming major issues – in fact, one of the machines had already been cannibalised to provide components to keep the other three running. From the point of view of bringing the new boards into production, the time it was taking to generate new programs – six weeks typically – was totally unacceptable. Clearly, to integrate the TSc production into the Caldicot facility, Mitel was going to need a new test platform.

TSc did have two newer machines at the Airdrie facility, however: a Marconi 4210 and an HP3065. Mitel considered moving these systems, but there were too many drawbacks. It would have been logistically more difficult, as production would have to have been stopped during the move. Both testers would have involved a learning curve, and neither was state-of-the-art – both have since been replaced by newer models. So we decided to choose a single platform that could accept fixtures from both – and could be adopted as the standard for years to come.

With a life-expectancy of ten years, the three main issues when selecting the new platform were:

- ease of transfer/translation of legacy software and hardware
- rapid program development
- outstanding test capability and performance

We also needed a flexible test strategy – that is, an in-circuit tester offering not only a good level of vectorless support, but also one that could take other options in the future.

This set of requirements pointed clearly to a non-multiplexed architecture – as fixtures from other systems can generally be accepted easily, using an adaptor. Test program generation is also faster, as programs can be written – and largely debugged – in parallel with fixture building. Boundary scan can require access to 400 to 500 test channels simultaneously, so it can be expensive to implement on multiplexed architectures.

The decision to adopt a non-multiplexed architecture cut the number of possible systems considerably – and the corporate need to choose one that was supported worldwide reduced it still further. Suffice to say that Mitel ordered a Teradyne Spectrum 8852, to a tight delivery time scale.

FAST PROGRAMMING

In parallel with the selection process, we continued to review how best to move TSc board manufacturing down to Caldicot. Although the original idea was to make use of the original fixtures and programs, closer examination of the actual fixtures prompted a rethink. We decided to build new ones, and write new programs, for all 25 boards. This decision was made in September 1998 – with a completion date of March 1999. Subsequently, the time scale was pulled forwards to 31 December 1998.

To help realise these ambitious (some would say ludicrous) time scales, Graham Smith, Huw Davies and Archie George made the most of the Spectrum's non-multiplexed architecture. Not only can test program development proceed while the fixture is being built, but it can also continue after it's complete. This allowed us to take an 'iterative' approach to bringing boards into production. The first production-released test program would achieve a specified (high) fault coverage of, say, 95%.

Production experience with this program, plus a review of the fault spectrum in system functional test, would then indicate which areas of the board would benefit from improved coverage. With a multiplexed fixture, the engineer is essentially committed as soon as the fixture is signed off. Since it is not usually possible to add tests later, the prudent test engineer needs to be much more confident that the program being signed off is, in fact, the final version.

EVOLVING TEST STRATEGY

Successful completion of the TSc boards is merely the first challenge for Graham Smith's group. Our Calidcot test environment can be characterised as 'low volume, high mix', although with some products – a range of line-diallers, for example – it's moving into 'mid-volume, high mix'. There are hundreds of boards in production at any point. Historically, most of these will have been tested on the Fairchilds, and

we certainly plan to migrate them to take advantage of the new machine's performance – as test speed is 60 to 70% faster.

Some functional tests could also be migrated onto the ICT. The Spectrum's standards-based approach – VXI chassis plus Windows NT environment – means that it is likely to be well supported with third-party instruments and software.

The benefit of migrating functional test is to reduce failures at end-of-line system test, which can become a bottleneck. Problems caught earlier in the production cycle are easier to diagnose and cheaper to rework. Any improvements to the manufacturing process required can be put in place much more quickly. One example that could be implemented is the ISDN loop-back test. The one issue that doesn't need to be considered is the extra time taken on on the in-circuit tester. The loop-back test, for example, might add a minute to the two-minute in-circuit cycle time.

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A non-multiplexed test fixture is intuitive to understand, so any competent test engineer will subsequently be able to add programs – including functional tests. And this in no sense relies on the availability of the original programmers.

It may be that access will be an issue on future boards. But, in the short term, we have been successful in managing this issue in co-operation with the designers. Good links between the FABmaster translation tools and 21 of the most commonly-used CAD packages – Cadence, Mentor, OrCAD, Tango are among those used by Mitel – allow the test group to give feedback on potential access issues in proposed design, within a few hours.

At some stage, however, there will be a device or layout that can't be fully tackled using ICT methods, and it is here that the new machine's options will become important. As well as using a functional approach, we have the option of boundary scan to test these parts of a board – although both test and design engineers are well aware of the overhead that this will impose.

SUCCESSFUL AND COST-EFFECTIVE

We still regard in-circuit test as a successful and cost-effective strategy. By comparison with boundary scan and functional test, program generation is low cost and quick, the tests themselves are fast to run and the level of diagnostic information is high. Yes, we will need to move on to other techniques as test access becomes more difficult. But by specifying a platform supporting various possible test strategies, we are in control of the process, enjoying the benefits of ICT for as long as it can be used – without closing the door on other approaches where it cannot.

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