

# THERE IS SUCH A THING AS A FREE LUNCH!



**A true scheduling story by Laurent Othac  **

This article first appeared in Service Management Magazine June 2008

What is it about the word ‘scheduling’ that its mere mention can reduce a grown man to tears? Perhaps it has to do with the fact that scheduling is often associated with a simple problem which rapidly escalates into insanely complex levels of difficulty when one tries to tackle it.

In the Field Service industry, scheduling is about matching technicians to jobs whilst following a given set of business rules. So far so good. But the matching has to be efficient. No point in sending Bob to Birmingham, then to Manchester, back to Birmingham and then off to Manchester again. Not only will we end up with a rather cross Mrs Bob but we’ll also rapidly run the business into the ground. So we introduce some simple rules: Bob lives near Birmingham, so we’ll only ever give him jobs in Birmingham. Sorted. But wait, what if Bob has just finished a job and there is another one he can do just round the corner, but outside of his area. Surely Bob should do that

job, but the rules simply won’t allow it. Well, let’s introduce another rule... The next day, Bob has two jobs to do but has time to do only one of them. Which one do we choose? How do we give one priority over the other? More rules. Service operations are notoriously complex and new constraints are rapidly followed by more new constraints and before you know it a mass of complex mutually conflicting rules submerges the poor souls trying to bring order out of chaos. Familiar story anyone?

Enter the computer programmer, and behold the power of Visual Basic! Kevin from IT tells you that it’s just a matter of writing a small rules-based program and, before you know it, you

have a lovingly crafted, fast and powerful way to produce, er, the same incredibly bad job allocations as before. Who’s been there? The thing is, you see, that underpinning any efficient schedule is an unpleasant mathematical principle called NP-hardness. No, I don’t understand it either but I’ve been told that NP-hard problems are those that you could try to solve by letting the biggest computer in the world run for 100 years and you still wouldn’t be closer to a half-decent solution. In fact if you were to collect all the particles in the universe and make a great big computer out of them, then let that computer run until the end of time, well, how can I put it delicately... you’d still be stuffed.

That's NP-hardness for you.

Despite this, many people have had a go at the problem using what are called in the trade 'naïve' algorithms—no offense if you've tried it yourself—and ended up with the old computer-the-size-of-the-universe thing. Some non-specialist software vendors even launched their very own Rules Engines. All were expensive failures... very expensive failures. Forgive them for they know not what they do. So there you have it, you now know for sure that you have tried and failed to solve the massive problem you have on your hands, and to add insult to injury you've paid an obscene amount of money for the privilege.

It was eventually realized that in order to solve the scheduling problem intelligently you had to address the underlying mathematical conundrum. This could be achieved but would neither be easy, nor cheap, nor quick, and the specialist scheduling industry was born. Many years down the line a number of scheduling systems have become available on the market, some good, some bad, some indifferent—excuse me... my Chairman does insist that there is only one that's any good, a shining beacon of affordable perfection, but which the magazine editor forbids me to name in this column.

All first-generation scheduling software solutions are based on



**Laurent Othac   is CEO and founder of 360 Scheduling and skillfully masquerades as a world authority on scheduling and optimization. He has spent most of his life trying unsuccessfully to solve absurdly complex math problems, only to be ridiculed by his younger and much more talented co-workers. Laurent was born in France and now lives in Nottingham, England where he enjoys the food and the weather.**

published algorithms initially devised to solve mathematical teasers with funny names like the Traveling Salesman, the Chinese Postman and even the Recruiting Pirate (OK, I made this one up.) Actually, these algorithms also have funny names: Tabu Search, Simulated Annealing, Genetic Algorithm, GRASP, Harmony Search, etc. What is it with eggheads? Anyway these algorithms do work after a fashion and produce relatively acceptable schedules in a few hours of computing time. However these generic methods rapidly hit an efficiency limit due to the No Free Lunch (NFL) theorems. I kid you not, Google it.

My freakishly clever young colleagues reliably inform me that NFL theorems dictate that all optimization algorithms will perform equally well on average across all possible problems. This means that those algorithms which are good at helping traveling salesmen and Chinese postmen must be poor for

all other applications. It is mathematically impossible to be good at all things, and that is why the traditional algorithms are at best mediocre when it comes to field service scheduling. No Free Lunch for our mobile workforce.

... or so it was thought. In the last few years some very talented individuals pondering over fiendishly difficult math have made groundbreaking algorithmic advances. These leverage the NFL theorems by being deliberately poor at solving problems that are NOT related to field service scheduling, whilst being incredibly good at providing efficient job-to-technician allocations in an actual mobile field service delivery environment. These modern algorithms are therefore on average as efficient as the old algorithms, but by ignoring those problems that are not relevant to the business needs, outperform everything else where it matters, and that's as good as a Free Lunch!

You won't find details of these modern algorithms published on the web or anywhere else for that matter as they are heavily protected trade secrets, a black art of sorcerers' cauldrons brewed for years by the cleverest people you'll probably ever meet.

A Free Lunch it may be, but it ain't no picnic.

The opinions reflected in this article are the author's and are not necessarily shared by Service Management Magazine, but they should be.

