# The history of BigDeal
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## The camping

The scene is a camping near Deauville France, where a bunch of Amsterdam bridge players were staying to play the local Bridge festival. It must have been early 1990's in my recollection. My memory is that I was playing and sharing a tent with Jan Elfrink, but he plays no further part in this story. At a certain moment during this week, I was approached at this camping by another Amsterdam bridge player, Koen Gijsman.

Koen talked to me about bridge software, he was employed as a programmer at the firm BridgeSoft from Onno Janssens. He knew I was a programmer myself and wanted to share something clever he thought of. It had to do with storing bridge hands in a small space. These were the days when memory was still expensive, and he needed to store lots of bridge hands. He told me his invention was to use two bits per card to encode which player had that card. So, for the Ace of Spades the encoding would be 00, 01, 10, or 11 for N, E, S and W. A total of 104 bits per hand. And he finished his story with the phrase "And you cannot get smaller than that!".

I thought about that for a moment, but then it occurred to me that his encoding would allow to give North all 52 cards, by just using 104 zero bits. I told him this and then said that because of information theory this must mean there exists a smaller encoding somehow. He grudgingly agreed and then I guessed that you might get it down to 96 bits. Of course, being around 1990 on a camping, without any possibility of computing the necessary factorial expression, this just remained a guess.

## Back at Vrije Universiteit

Back in Amsterdam at Vrije Universiteit where I worked, I sat behind my terminal and called up the Unix *bc* program, for arbitrary large number arithmetic, and for the first time saw this number: 53,644,737,765,488,792,839,237,440,000. I then computed 2 to the power of 96, which was bigger, and 2 to the 95 which was smaller. So, at the camping I was extremely lucky to guess the exact number. You need 96 bits of storage to store a bridge hand, if only you knew how to do the encoding.

One day, at lunch I happened to mention this in the company of some graduate students, and one of them, Philip Homburg, was interested in how this theoretical encoding could work. He knew nothing about playing cards, let alone bridge, but since shuffling is just permuting numbers from 0 to 51 that was no hindrance. He would think about it…

The next morning, he was already in my office showing two functions, one encoding these 4 sets of 13 numbers into a 96-bit encoding, and the other for the reverse operation. I looked at it, checked the operation, thanked him, and filed the code for future reference. Nothing in my mind was thinking about dealing programs.

## Duplicate sets

At a certain point, rumors were getting around that players at tournaments around the world had recognized sets of hands, computer dealt, and it was widely thought to be operator error. But it set me thinking again, and being a research programmer in the Amoeba project I already knew that

getting random numbers was less easy than it looks. Also, I was aware of the Birthday Paradox. Also, I began thinking about the sizes of seeds of existing programs. It quickly occurred to me that a naïve implementation of any dealing program would probably use 32-bit seeds, with all the trouble that would bring for this purpose.

In my mind I developed the idea of a new dealing program that would use at least 96-bit arithmetic, but this was quickly improved by adding crypto hashes for security. You could say the design of BigDeal was finished in my head. But I did not write anything.

What I did was tell people, when they were discussing computer hands, that existing programs sucked, and I could do it better. Given my connection to the Dutch Bridge Federation, they were also aware of this.

## Maastricht

In the year 1999 the Dutch Bridge Federation had contracted for the Olympiad to be played in Maastricht in 2000. They wanted to do something special and for some reason at that point they remembered my story about dealing. They asked a professor at University of Maastricht, Koos Vrieze, to help with the mathematics and he volunteered a grad-student Jeroen Kuipers to design the encoding algorithms and to put some scientific solid base on it. Basically, I was then called in with words like: "Now put your money where your mouth is…". No way to get out of that anymore.

All in all, it took some two months to write the software and documentation, where most of the difficulty was figuring out the convoluted formats to write the output. The program was demonstrated to the Dutch Bridge Federation and after some tests they used it for one whole season of top-level play.

In the meantime, they had probably also convinced the WBF to use this new software, which may have been easier because then Ton Kooijman was championship manager. So, the Olympiad Maastricht saw the first use of BigDeal in international competition. It has not disappeared there since.

## The rest is history

All in all, the BigDeal software has been largely unchanged since then. It has been a pleasure designing and writing it.