



Redefining Randomness

# Use Case: Banking Sector

## ERNIE 5 Goes Quantum

### Quantis True Random Number Generator



Customer: NS&I
Industry: Banking (Savings)
Country: United Kingdom



#### Business need



Add a reliable source of randomness and sophisticated security & integrity check mechanism

#### Solution



Quantum random number generator PCIe form factor, AIS 31 validated & specific software development

#### Results



A reliable and faster source of randomness which generates 100% trust

### Business need

[National Savings & Investments](#) (NS&I) is one of the largest savings organisations in the UK, offering a range of savings and investments to 25 million customers among which Premium Bonds, one of the most well-known financial products in the UK. All products offer 100% capital security, because NS&I is backed by Her Majesty’s Treasury.

Since Premium Bonds were launched in 1956, a very special machine called ERNIE (Electronic Random Number Indicator Equipment) has won the affection of the British public, one representing the hopes and dreams of 21 million people across the country. ERNIE, the Premium Bonds Electronic Random Number Generator, is responsible for drawing over three million prizes each month, worth more than £90 million.

There have been four generations of machines since its creation. If ERNIE 1 was still in use today, it would take over 100 days to complete a draw. After 15 years of loyal service, ERNIE 4 has been decommissioned and replaced with a **faster machine to cope with the increasing volume of numbers that have to be produced every month, while ensuring the best randomness and security.** The popularity of Premium Bonds has soared so much so that over 78 billion bonds are now eligible to win any of the three million prizes each month.

To achieve this goal, partner Atos selected ID Quantique to develop the 5th generation ERNIE prize draw system (“ERNIE”) as part of the services they provide to NS&I.

## Solution

ID Quantique designed and developed a complete solution for ERNIE based on the customer's requirements.

IDQ's Quantis-AIS31-PCIe was selected as the best product to serve ERNIE. Quantis AIS31 is a physical (hardware) quantum random number generator which has been validated according to the stringent AIS31 test methodology. It has passed the most rigorous testing up to level PTG.3 which allows it to be used in more strongly regulated gaming or security markets.

The ERNIE Software application consists of several tiers including a graphical user interface, backend processing and a repository component. The system seamlessly integrates with existing hardware. Each tier consists of several sub applications including the draw & log viewer, management, data & configuration manager, etc. Advanced security policies, integrity checks and authentications methods were implemented, including auditing, data encryption, RNG tester, etc.

The project was successfully handed over to the customer after performing extended tests by different parties. The Government Actuary's Department (GAD) and NS&I carried out regular testing to ensure ERNIE's randomness prior to its first draw and both GAD and the National Audit Office will continue to conduct regular checks of ERNIE.

## Results

The 5<sup>th</sup> generation of ERNIE went Quantum officially after going live on March 2019. It has been built incorporating the newest quantum technology, meaning that March's draw took just over 12 minutes to complete the requisite amount of numbers, compared to 9 hours of its predecessor ERNIE 4.

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*Premium Bonds are as popular as ever before and ERNIE has been an integral part of that journey, changing the lives of millions of our customers since 1957.*

*But ERNIE and Premium Bonds are also moving with the times; ERNIE, using quantum technology, will now be able to generate the millions of numbers required at a much faster pace, continuing to give customers a chance to have some fun while having a secure place for their savings.*

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**Mr. Ian Ackerley**  
NS&I Chief Executive