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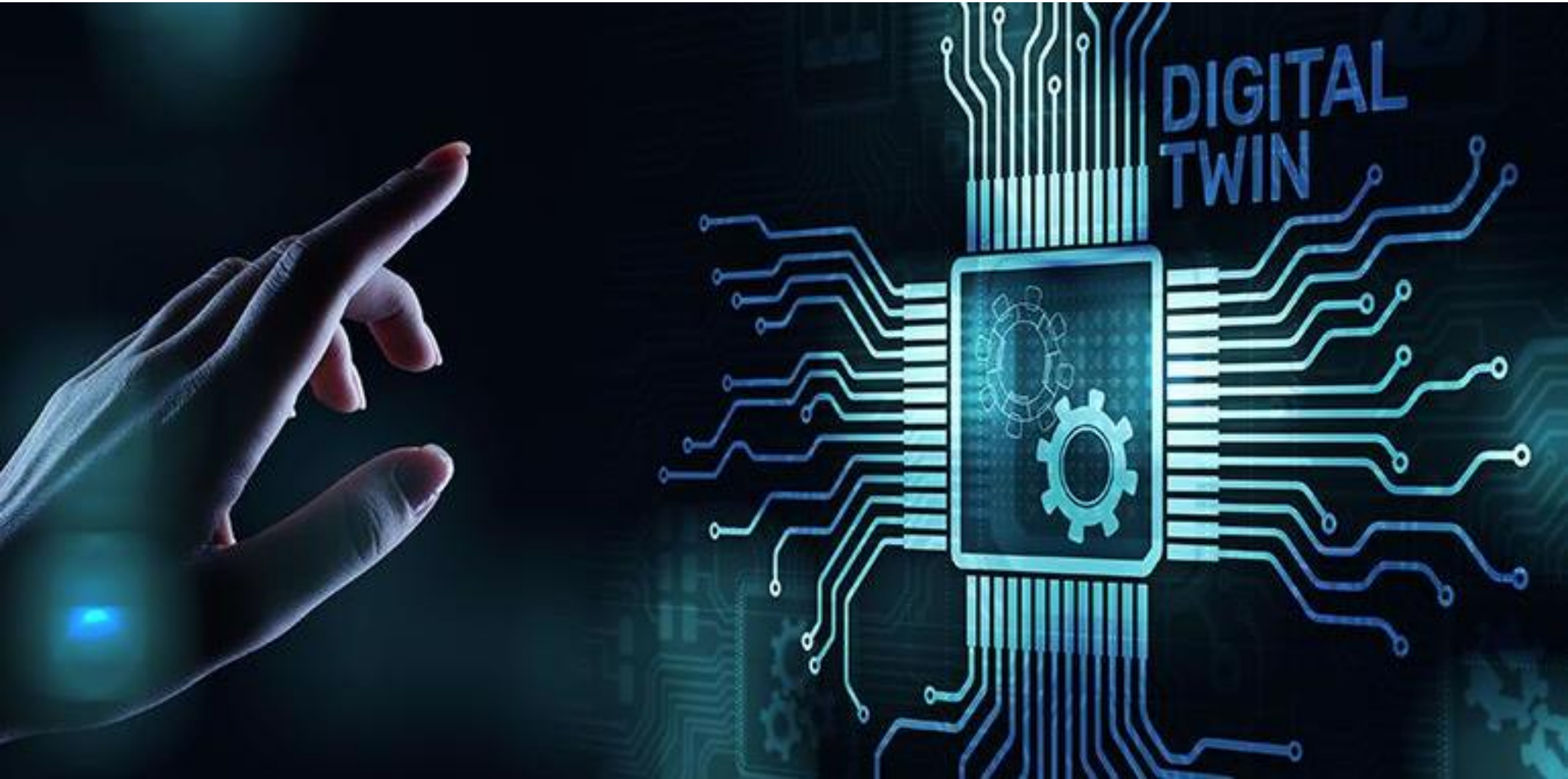
What is a digital twin?



SHD asks and answers: What is a digital twin?

A digital twin is the complete virtual representation of a physical object or, increasingly, of a network or process. The term was coined by NASA in 2010 when they were looking for better ways of simulating their spacecraft. Hitherto, the only way of simulating the performance of any system of significant complexity was to play with a full size replica. That is costly, slow and in the case of a large system such as an electricity distribution network, or a supply chain, simply not possible.

However, the ability to process ever-larger volumes of data, and the ability of Internet of Things enabled devices to supply that data, both in real time, mean that it is now possible to create an entirely faithful, purely digital, version of the real thing.

A digital twin can be used in a number of ways. Firstly, it can form part of the design process, using real life data of component performance in comparable situations to explore how a proposed product or system can be expected to perform.The digital twin of a system in operation is, within a few micro-seconds, in the same state as its real life counterpart. This means that the full system is available for instance for the application of machine learning and artificial intelligence to system monitoring, diagnostics and prognostics in real time. Bear in mind that it may not be possible to do this on the physical system itself, components of which may be separated by thousands of miles. The digital twin can also capture a permanent record of transitory events in the physical system, useful for failure analysis.

ML and AI can work with the digital twin to suggest (or, autonomously, implement), improvements, tweaks, optimisations and mitigations to the system. Further, it becomes possible to run 'what if' simulations, not once but many times (which matters because in complex systems, like supply chains, the same inputs don't always generate the same outputs). Importantly, the digital twin, and the operations performed with it, can easily be shared with other partners and systems, and the results fed back in to the physical system.

Digital twins cannot yet make a big contribution to supply chain operations at global scale, simply because not enough of the elements are able to furnish a continuous stream of real time information. At smaller scale, say a domestic distribution network, or the operation of a major fulfilment centre, they are beginning to be used.

However, although development tools are increasingly available and affordable, as is the necessary computational power, and the IoT-enabled devices and assets needed to feed the twin are becoming more commonplace, they still represent a large investment and critics of the digital twin concept contend that there is a real risk of over-complicating matters for somewhat nebulous or ill-defined business benefits. Basic concerns around security, confidentiality and vulnerability to cyber-crime also make others wary of going down the digital twin 'road'

https://www.shdlogistics.com/technology/what-digital-twin.