



Australian Government

MEM29012 Access and use a digital twin for operational purposes

Release: 1

MEM29012 Access and use a digital twin for operational purposes

Modification History

Release 1. New unit.

Application

This unit defines the skills and knowledge required to effectively access and use a digital twin for operational purposes in a manufacturing, engineering or related industry workplace. The unit covers the different uses and benefits of digital twins as virtual representations of physical objects and/or processes, the communication between digital twins and real objects and processes, and the interaction of digital twins with other Industry 4.0 related technologies. The unit does not cover the design and coding of digital twins.

The unit applies to individuals responsible for using digital twins with other manufacturing and industry 4.0 systems and processes.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Pre-requisite Unit

Nil

Competency Field

Applied technologies

Elements and Performance Criteria

Elements	Performance Criteria
Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
1. Determine digital twin access requirements	1.1 Follow standard operating procedures and comply with work health and safety (WHS) requirements at all times 1.2 Check purpose, scope and information requirements for digital twin task 1.3 Confirm digital twin access as the most appropriate method for required task 1.4 Check status of connections to and from digital twin and physical objects or processes 1.5 Identify and review cyber security access protocols for the digital

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	twin
2. Undertake digital twin tasks	2.1 Access digital twin dashboard and select correct layer or test mode 2.2 Interrogate digital twin to obtain required current, historical or predictive data 2.3 Assess relevance and integrity of digital twin data according to workplace procedures 2.4 Assess implications of digital twin data for matching physical object or process 2.5 Use digital twin to initiate action in the matching physical object or process where required 2.6 Recommend adjustments to physical object or process according to workplace procedures
3. Assist in digital twin improvements	3.1 Document connections to and from the digital twin to physical object and process sensors, PLCs and network gateways 3.2 Assess suitability of sensors and sensor placement for digital twin 3.3 Document, maintain and update operating and response instructions for SCADA system 3.4 Provide support to others in the use of SCADA system according to workplace procedures

Foundation Skills

This section describes those language, literacy, numeracy and employment skills that are essential to performance.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

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Industry 4.0 related systems include one or more of the following:

- industrial internet of things (IIoT) devices
- collaborative robots
- networked and cloud connected traditional robots and other industrial automation
- networked and cloud connected supervisory control and data acquisition systems (SCADA)
- networked and cloud connected enterprise resource planning (erp) systems
- networked and cloud connected CAD and CAM systems
- digital twins
- augmented and virtual reality systems
- networked and cloud connected CNC and additive manufacturing machines
- networked and cloud connected data storage and processing facilities
- networked and cloud connected edge devices
- other networked and cloud connected digital devices and systems relevant to the workplace

Connections to and from a digital twin to a physical object or process include one or more of the following:

- sensors
- programmable logic controllers (PLCs)
- edge devices
- wired, WiFi and cloud networks and gateways

SCADA system components include one or more of:

- supervisory computers
- remote terminal units
- programmable logic controllers (PLCs)
- communication including networking infrastructure
- human–machine interfaces

Digital twin tasks include one or more of:

- testing design of physical objects and/or processes
- gathering data on physical object or process current, historical performance or predicted performance under current conditions
- condition monitoring
- simulation and scenario modelling

Unit Mapping Information

No equivalent unit

Links

Companion Volume implementation guides are found in VETNet -

<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2>

Assessment Requirements for MEM29012 Access and use a digital twin for operational purposes

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Performance Evidence

There must be evidence the candidate has demonstrated the ability to:

- follow cyber security protocols for accessing a digital twin
- access digital twin dashboard, functional layers and test modes on at least two occasions
- use digital twin to access current or historical component or equipment condition monitoring-related data
- use a digital twin for predictive analysis of manufacturing scenario
- map and fault-find data pathways to and from sensors linked to physical objects and a digital twin.

Note: Where a volume and/or frequency is not specified, demonstration must be provided at least once.

Knowledge Evidence

There must be evidence the candidate has knowledge of:

- typical uses of digital twins in manufacturing and engineering including:
 - prototype analysis
 - condition monitoring
 - lifecycle analysis
 - predictive modelling of scenarios, products or processes
 - live monitoring of equipment and processes
 - supply chain visualisation
 - advanced analytics
- sources of data for digital twins including:
 - design specifications
 - production, maintenance and quality reports
 - business data including customer feedback
 - sensors
 - real time and historical SCADA and IIoT data
- types and scope of digital twins including:
 - prototype digital twins created to model a product or process before it is created
 - component digital twins

- machine, process or system level digital twins allowing interactions to be visualised and scenarios modelled
- two-way communication processes and protocols between digital twins and physical objects and processes
- processes for checking and harmonising digital twin data with other physical sources of data in the workplace including data generated from SCADA and IIoT systems and devices
- cyber security protocols associated with digital twins
- advantages of using a digital twin for data and modelling over physical assets including:
 - safety
 - potential longer life
 - lower operating cost
 - ability of a digital twin to visualise processes and provide information transparency in situations where obtaining data from the physical object or process is:
 - too dangerous
 - too costly
 - not possible without shutting down the equipment or process
 - unlikely to give the same degree of detail or accuracy as the digital twin
- situations where use or creation of a digital twin may be inappropriate:
 - a sufficient or regular flow of data to support the digital twin is not available
 - the physical object or process is not sufficiently complex to support a digital twin
 - the cost of creating and maintaining the digital twin is not worth the return.
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Assessment Conditions

- Assessors must:
 - have vocational competency in accessing and using a digital twin for operational purposes at least to the level being assessed with relevant industry knowledge and experience
 - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Where possible, assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions that cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills.
- There must be access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

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