



Multi-platform Digital Twins for Cobots

Steve Kerrison, ARTC

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What is a digital twin?



A digital twin is a **virtual representation** of a **physical object**. The twin can be used to reflect the **real-time status** of a device, **view historic behaviour**, exert **control** over the physical asset or **explore** new optimisations non-disruptively.

Twins can be made for:

- Robots / cobots
- Machine cells
- Production lines
- Products / components
- Anything in the factory





Possibilities



What problems can twins solve; what opportunities can they create?

View the status of assets anywhere, on any device

- Control room, smart display, smartphone, meeting room...

Highlight potential problems

- Visual cues for unusual data or behaviour
- Proactive maintenance

Integrate

- Use ROS-based control and simulation data.
- Combine twins from multiple assets of various types.

Review

- Use stored data to review an event that happened today.

Optimisation planning

- Increasing efficiency with the help of the digital twin's flexibility of view/manipulation.

View and manage your assets in ways not previously possible.





Examples



Monitoring of in-use equipment

Without twin

- Go and look at the equipment
- Restricted views / access
- Interfere with ongoing activities

With twin

- View on various devices
- Physically unconstrained observation
- Zero interference

Identifying the cause of a rejected component

Without twin

- Look at component
- Share photos
- Reverse engineer & speculate

With twin

- Replay process using twin
- Identify unusual activity
- Verify against physical evidence





Multi-platform Digital Twins for Cobots



This demo leverages web technologies to provide a cross-platform, accessible anywhere, real-time twin.

- There are two twins:
 - A UR10 cobot performing bin picking
 - A second UR10 cobot performing scan & plan
- Each is a separate visualisation, combined into one simple web-based dashboard.
- The twins are updated in real-time, several times per second, to reflect the status of the physical robots that they represent.

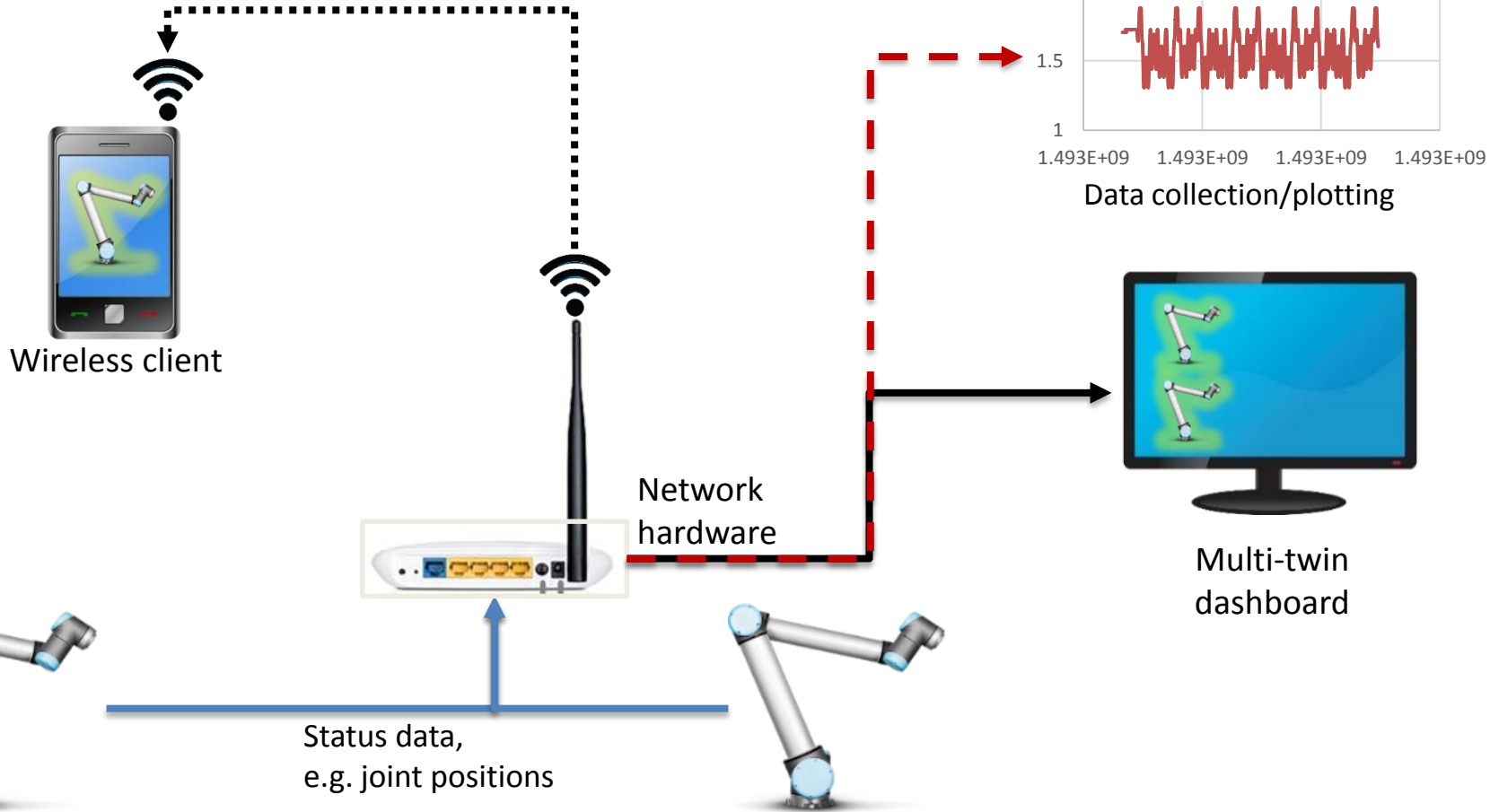


See for yourself on the factory floor!





Example Scenario





Demo

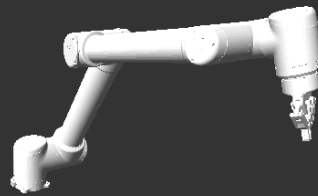


Factory of the Future: Digital Twin Demonstration



Bin picking with gripper

38 FPS (3-47)

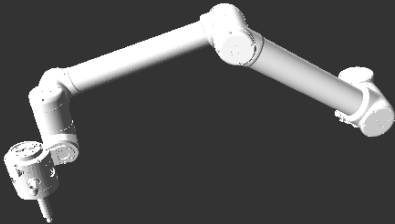


Move Joints		
J5 Flange	<div style="width: 20%;"></div>	-20
J4 wrist 3	<div style="width: 79%;"></div>	-79
J3 wrist 2	<div style="width: 95%;"></div>	-95
J2 Elbow	<div style="width: 48%;"></div>	48
J1 shoulder	<div style="width: 59%;"></div>	-59
J0 base	<div style="width: 0%;"></div>	0

Close Controls

Scan & plan surface polishing

40 FPS (3-47)



Move Joints		
J5 Flange	<div style="width: 0%;"></div>	0
J4 wrist 3	<div style="width: 12%;"></div>	-12
J3 wrist 2	<div style="width: 20%;"></div>	-20
J2 Elbow	<div style="width: 52%;"></div>	52
J1 shoulder	<div style="width: 39%;"></div>	-39
J0 base	<div style="width: 115%;"></div>	-115

Close Controls

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Summary



- Digital twins allow flexible visualisation of real assets.
 - Today's demo is a real-time example.
- They will be a key part of future factories
 - More efficient situation handling, planning, monitoring and more.
- Forming one set of use cases for the Industrial Internet-of-Things (IIoT).





Contact Information



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