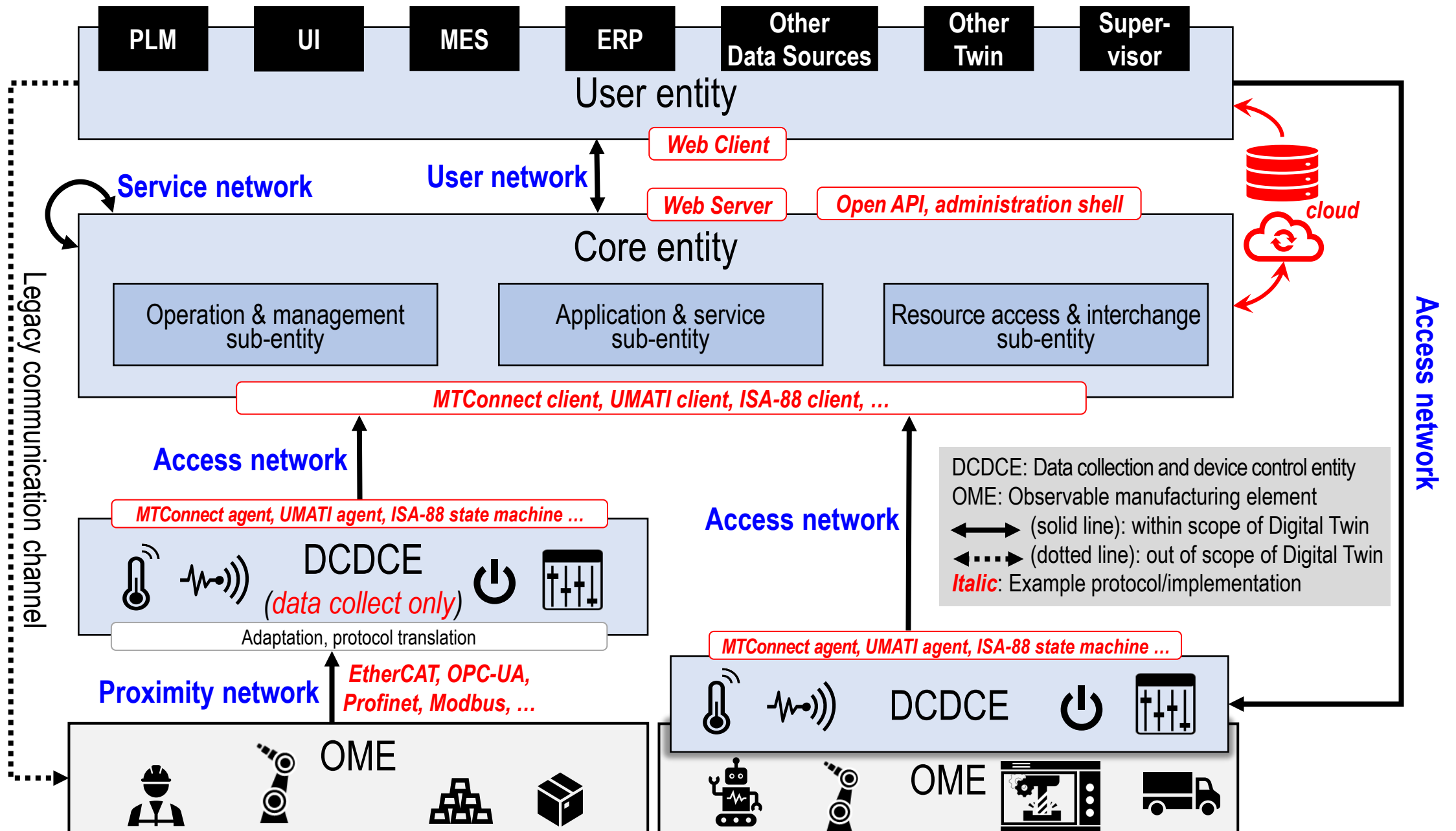


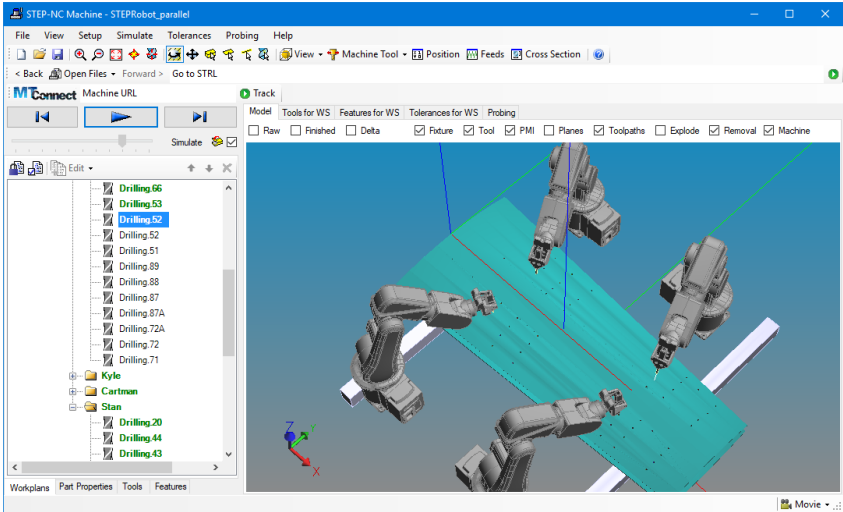
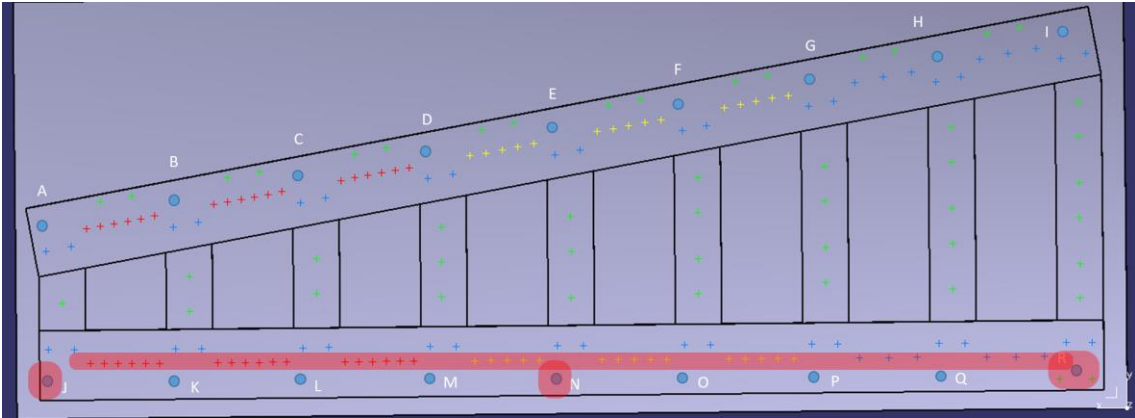
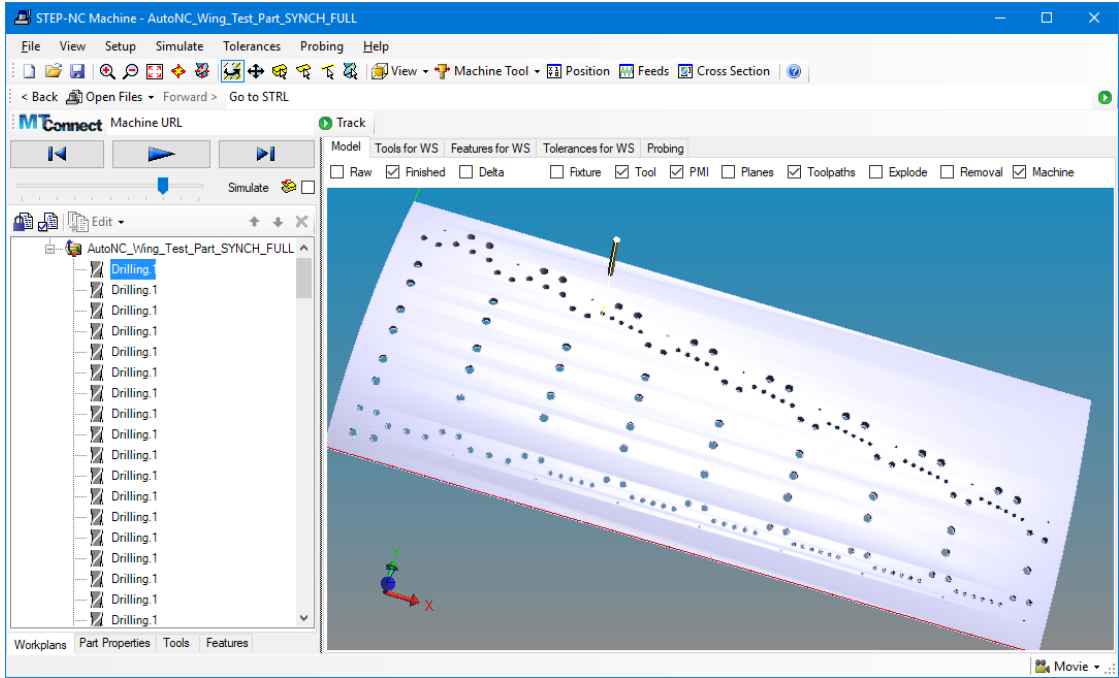
ISO 23247 Digital Twin Use case Testing

Results of July 14 Conference call

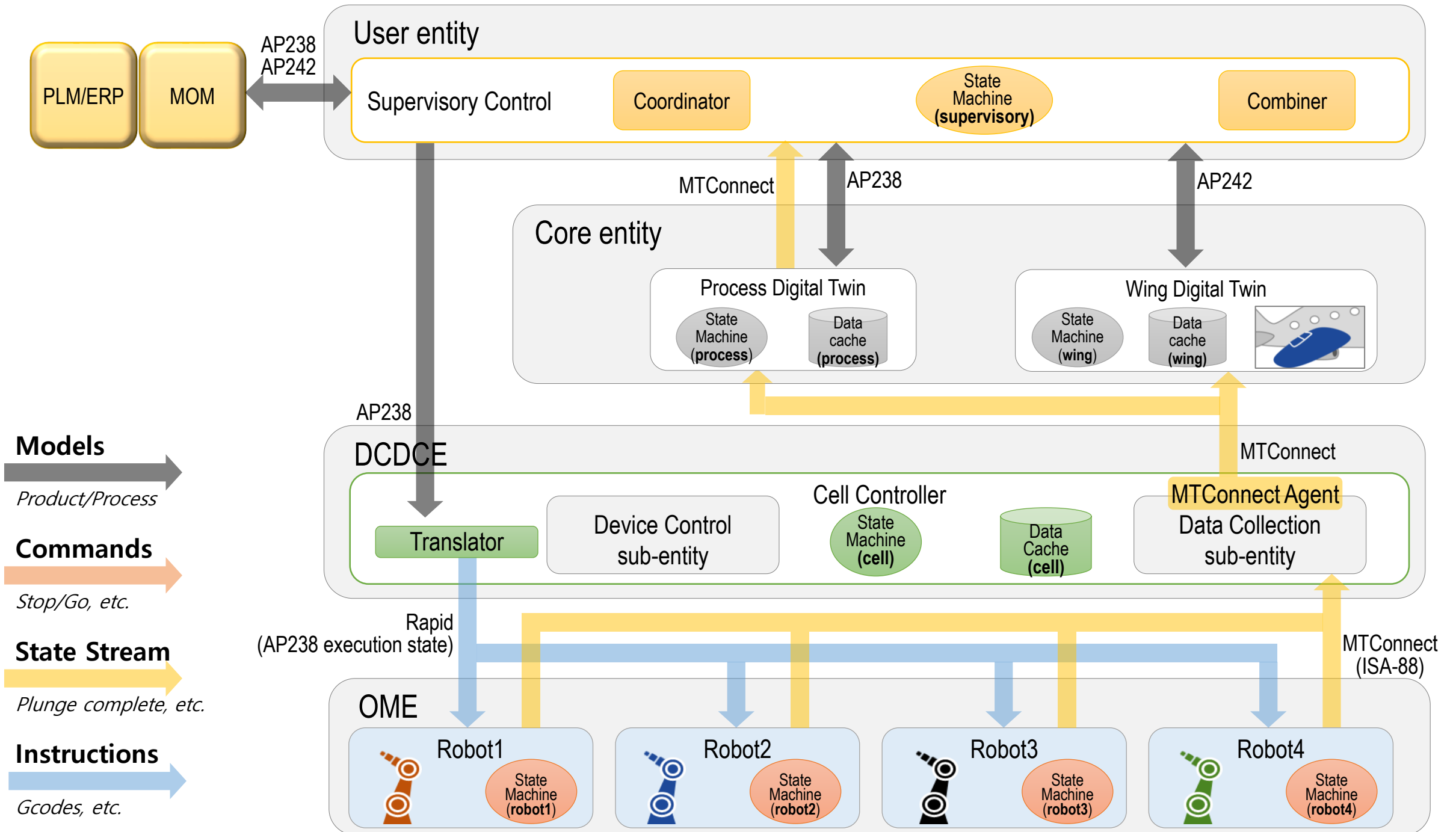
ISO 23247-4 Figure A.1



Use Case 1 – flexible schedule for robot drill & fill

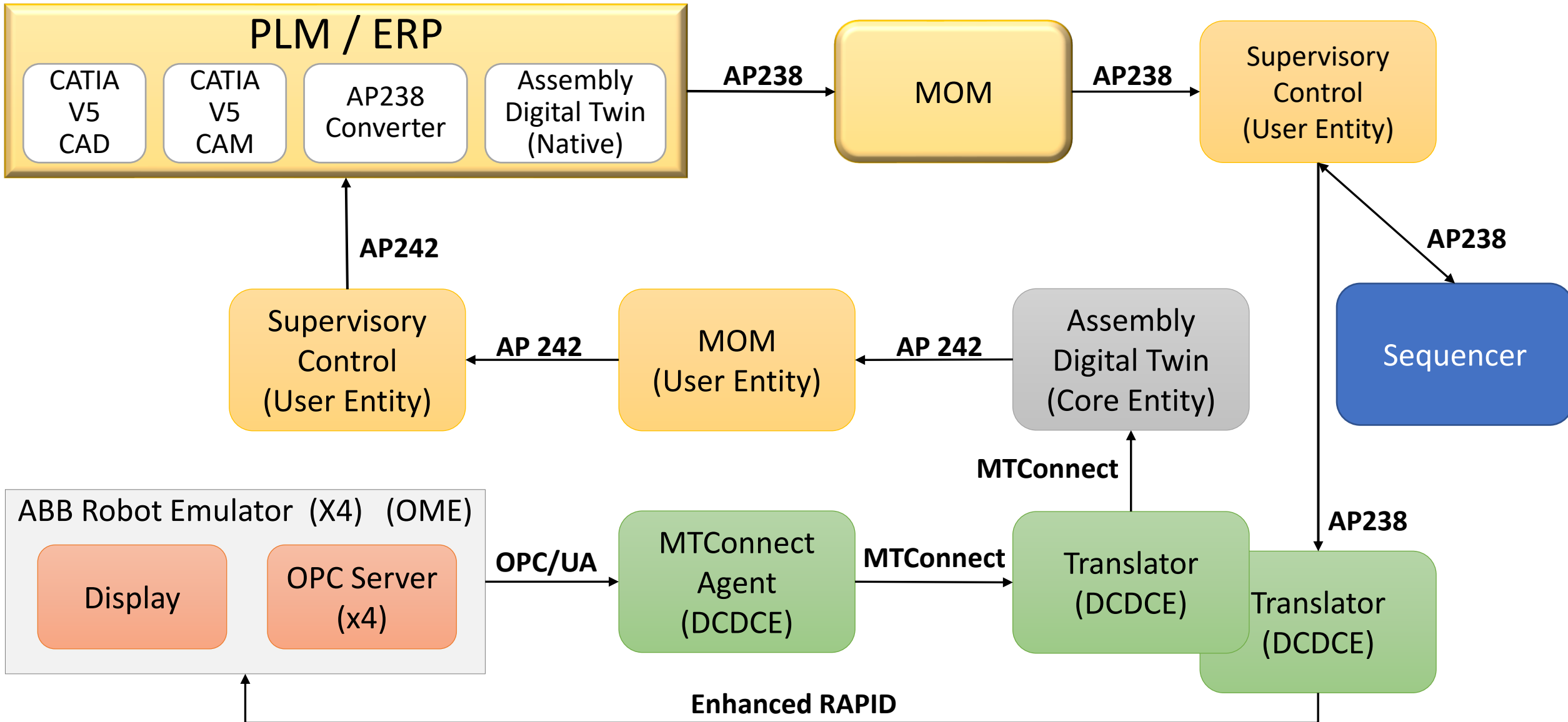


On-shoring can increase by 50%



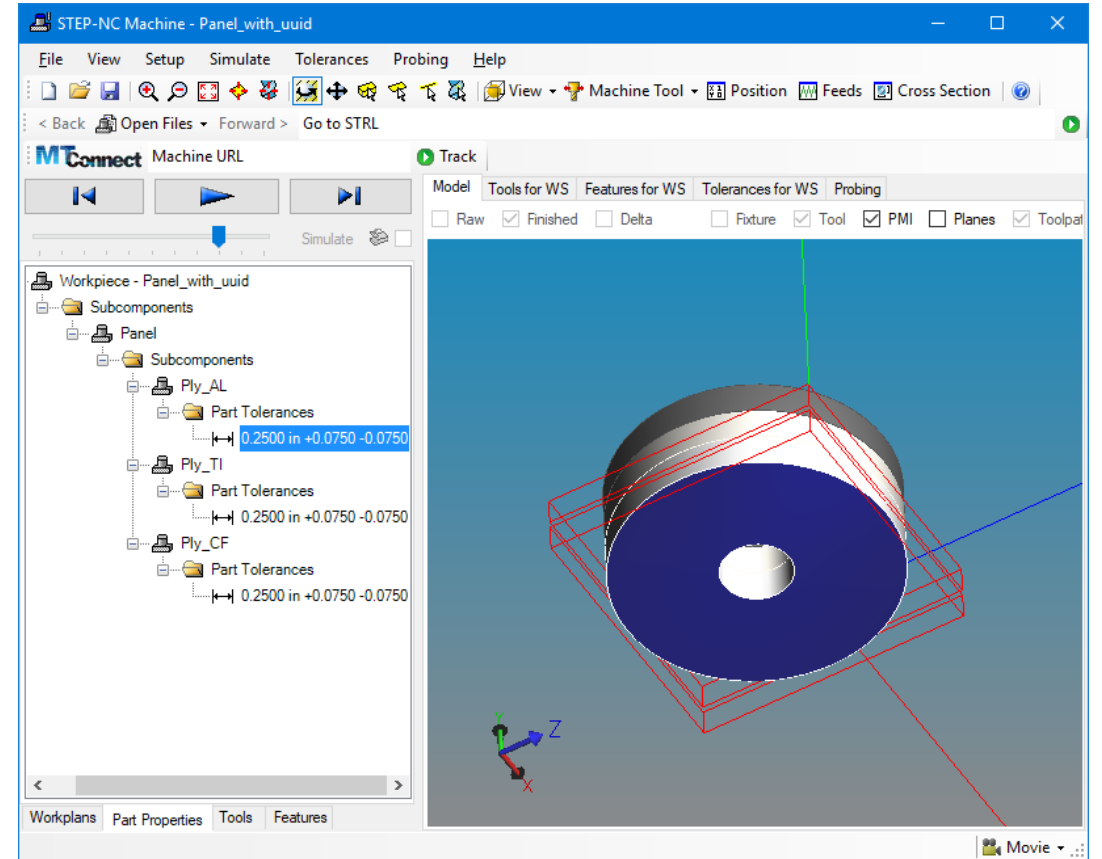
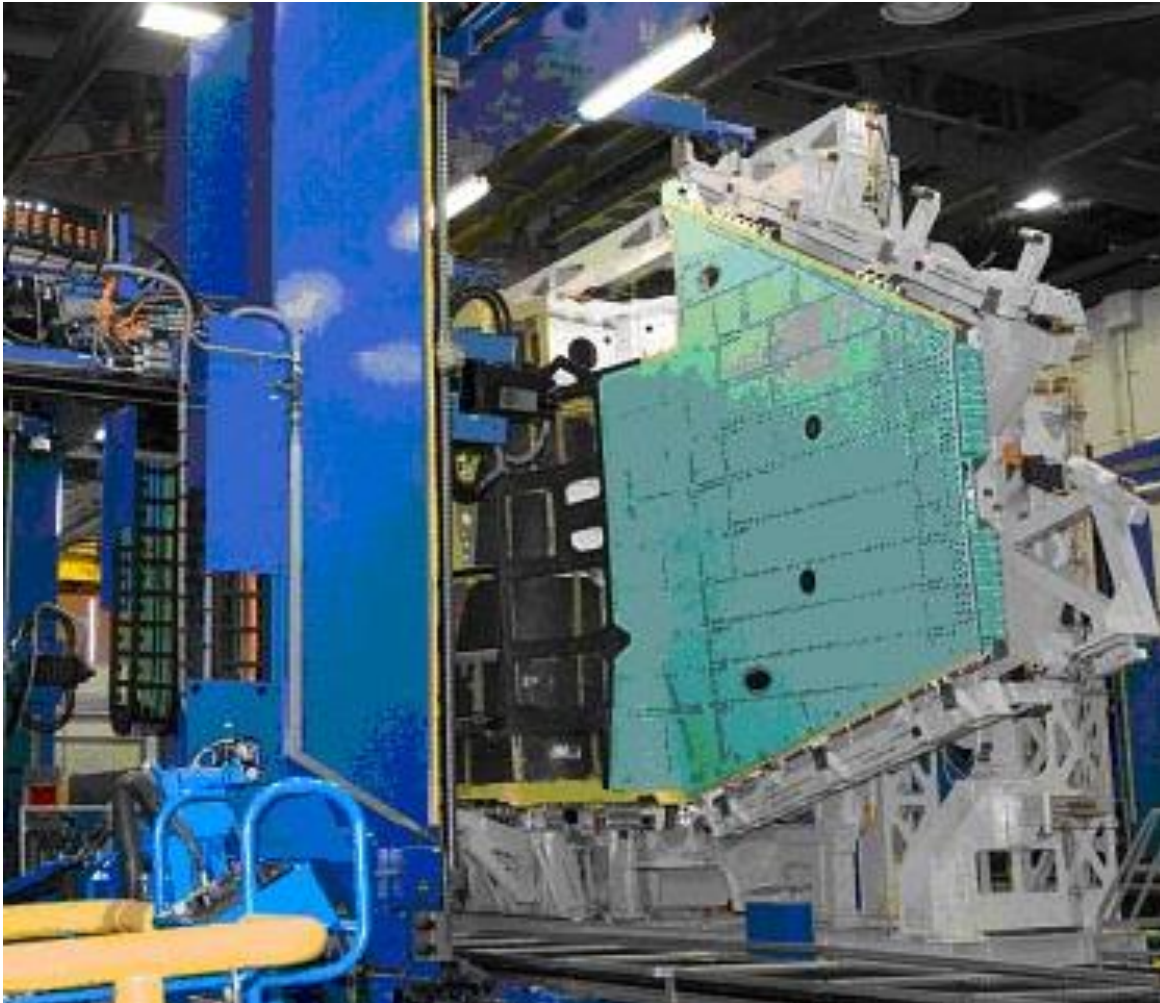
- Models** *Product/Process*
- Commands** *Stop/Go, etc.*
- State Stream** *Plunge complete, etc.*
- Instructions** *Gcodes, etc.*

Assembly/Process Flow

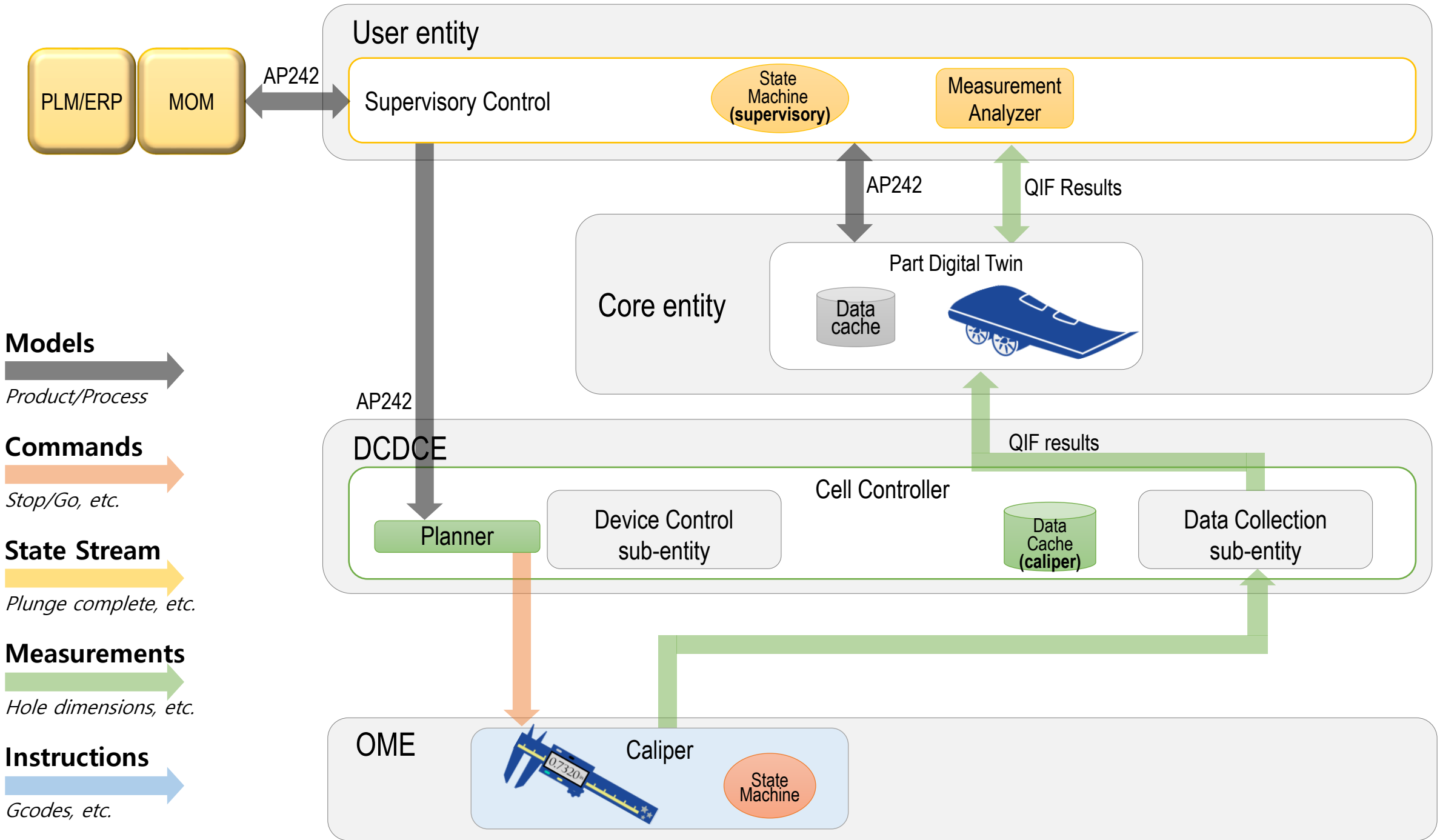


Group/Name	Task	23247 Use Case Reference	Completion Percentage	Completion Date	Status
Vice Commodore	Generate AP238 from CATProcess	External	100	6/22/2020	Complete
Fred Richter	Fake MOM	External	0		Asking
Fred Richter	Fake Supervisory Control	User Entity	0		Asking
AutoNC	Sequencer	User Entity/External Modules	0		Refused
Vice Commodore	RAPID Translator	DCDCE	50%		In Work
MicaH	ABB Emulator	OME/Robot 1-4	10%		in Work
BiTech	Loader Emulator	OME/Loader	0%		Asking
Will Sobel	MT Connect Adapter	OME/Robot 1-4	0%		Asking
Will Sobel	MT Connect Agent	OME/Loader	0%		Asking
Vice Commodore	Assembly Digital Twin	Core Entity	0%		Agreed
Vice Commodore	Generate CATPart from AP242	External	0%		Agreed
	Pack-ML State Machine	OME/Robot 1-4	0%		
	Pack-ML State Machine	OME/Loader	0%		
	Pack-ML State Machine	User Entity	0%		
	Pack-ML State Machine	Assembly Digital Twin	0%		
	Pack-ML State Machine	DCDCE	0%		
	Pack-ML State Machine	Supervisor Control	0%		

Use Case 2 – weight reduction

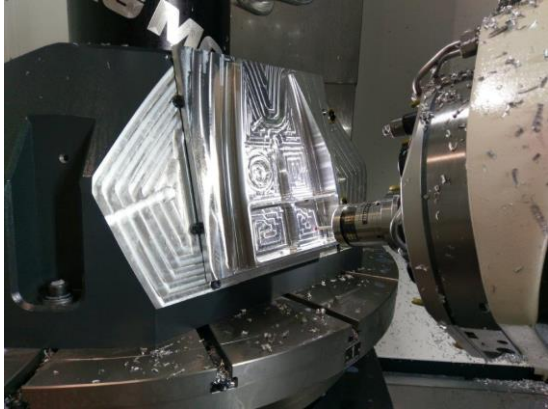


Exact match of fastener to hole depth
can reduce weight by 500lb

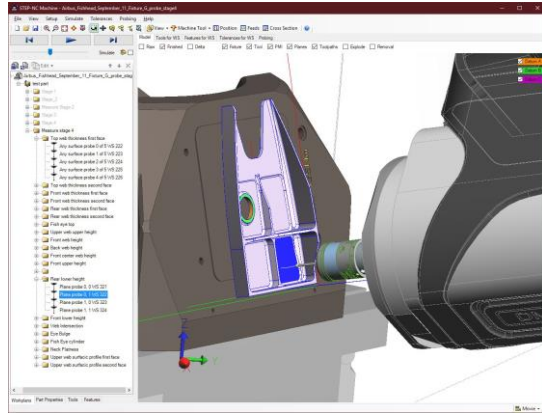


Group/Name	Task	23247 Use Case Reference	Completion Date	Completion %	Status
Jan De Nijs	Define Use Case		16-Mar-20	100%	Complete
Martin Hardwick	Document Use Case		22-Apr-20	100%	Complete
Jan De Nijs/L Maggiano	Author MBDs	PLM/ERP	14-May-20	100%	Complete
L Maggiano	Export AP242 Nominals	User Entity	14-May-20	100%	Complete
L Maggiano	Export QIF Plan	DCDCE	14-May-20	100%	Complete
Hany Abdel-Motaleb	Measure Parts (key-in)	OME	14-May-20	100%	Complete
Hany Abdel-Motaleb	Export QIF Measured Results	DCDCE	15-May-20	100%	Complete
Martin Hardwick	Import QIF Measured Results	Core Entity	20-May-20	100%	Complete
Martin Hardwick	Assemble AP242 Digital Twin	User Entity	20-May-20	100%	Complete
Sung Hei Kim	Revise Use Case		30-Jun-20	100%	Complete
Xometry	Fabricate Parts		17-Jul-20		Approved
Hany Abdel-Motaleb	Measure Parts (as-built)	OME	24-Jul-20		
Hany Abdel-Motaleb	Export QIF Measured Results	DCDCE	24-Jul-20		
Martin Hardwick	Import QIF Measured Results	Core Entity	31-Jul-20		
Martin Hardwick	Assemble AP242 Digital Twin	User Entity	14-Aug-20		
Jan De Nijs	Evaluate Assembled Digital Twin	PLM/ERP	28-Aug-20		

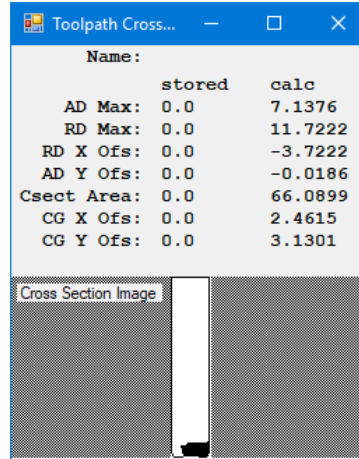
Use Case 3 – tool life optimization



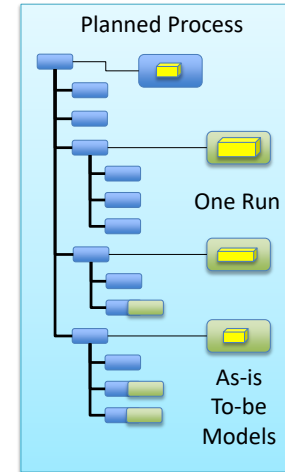
Machine parts



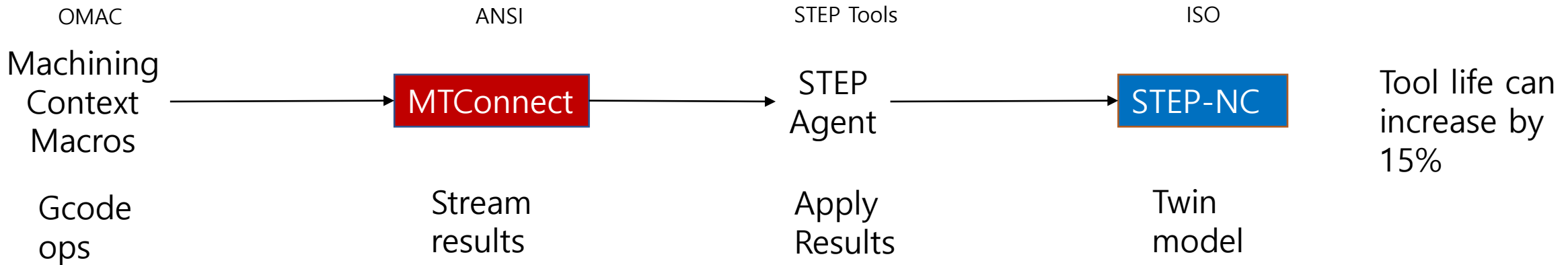
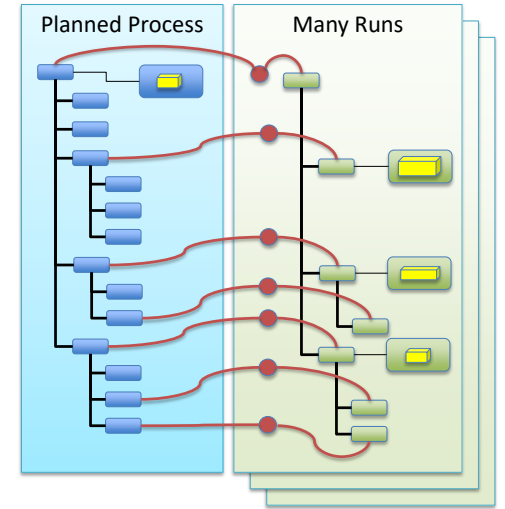
Monitor tool diameter



Compute tool engagement



Store linked data



ISO 23247-4 Figure A.3

