U.S.NRC
UNITED STATES NUCLEAR REGULATORY COMMISSION
Protecting People and the Environment

Data Validation and Reconciliation: Applying Digital Twins to Increase Core Power

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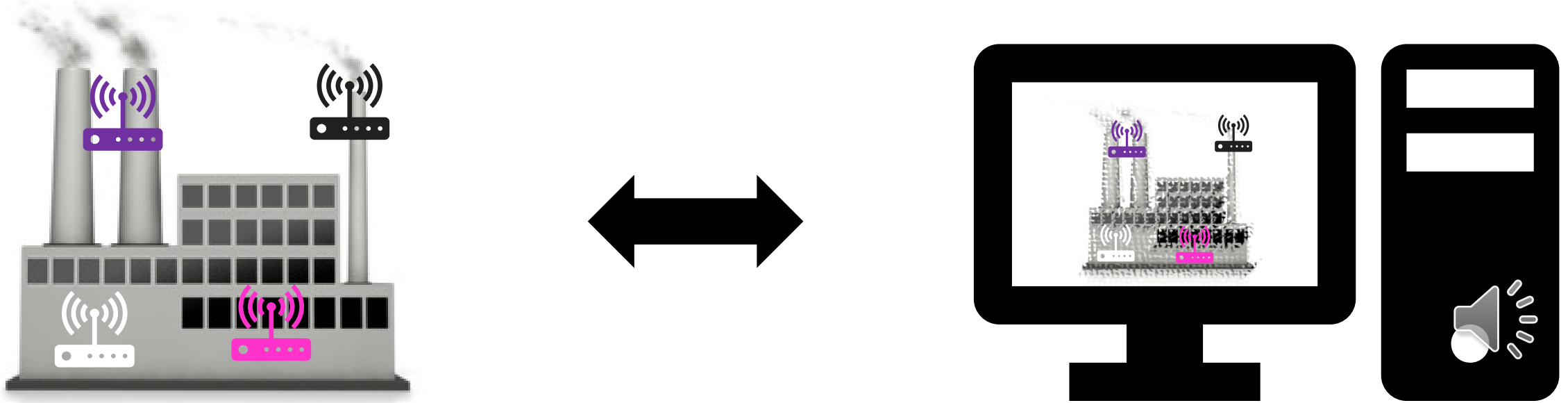
What is a Digital Twin?

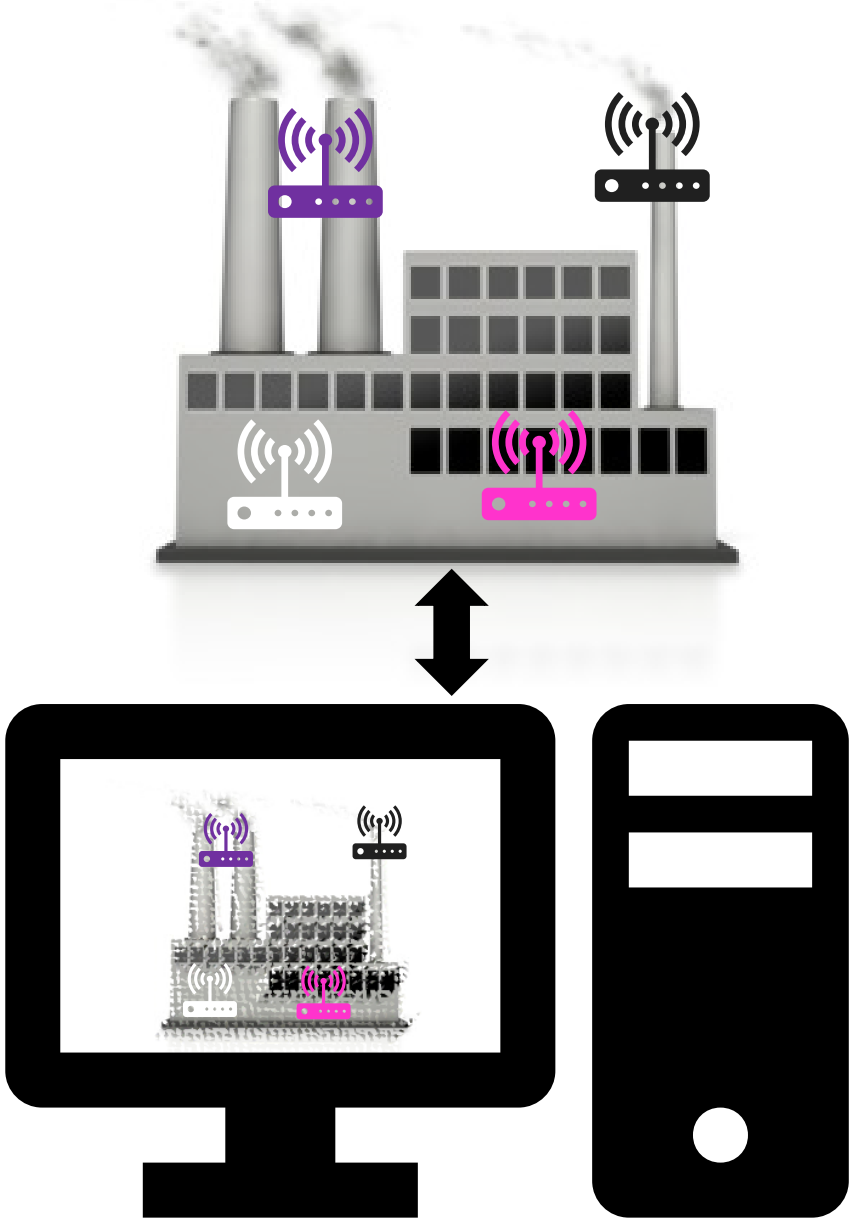
Criteria 1 - There is some physical reality.

Criteria 2 - We have a virtual representation of that reality.

Criteria 3 – We can *exchange* information between the physical and virtual reality.

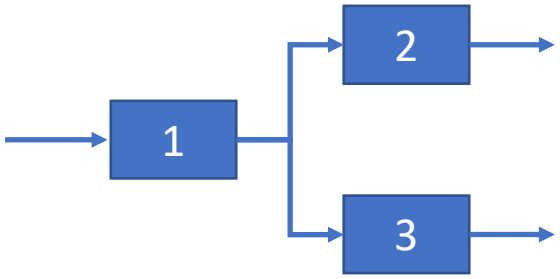


What is Data Validation and Reconciliation?



Measurements	$\bar{x}$	s^2
Flow Meter 1	245	39.06
Flow Meter 2	250	40.67
⋮	⋮	⋮
Thermocouple 1	315.9	3.5
Thermocouple 2	427.5	4.7
⋮	⋮	⋮
Pressure 1	2001.2	50.3
Pressure 2	1856.3	46.5
⋮	⋮	⋮

Constraints



Flow 1 = Flow 2 + Flow 3

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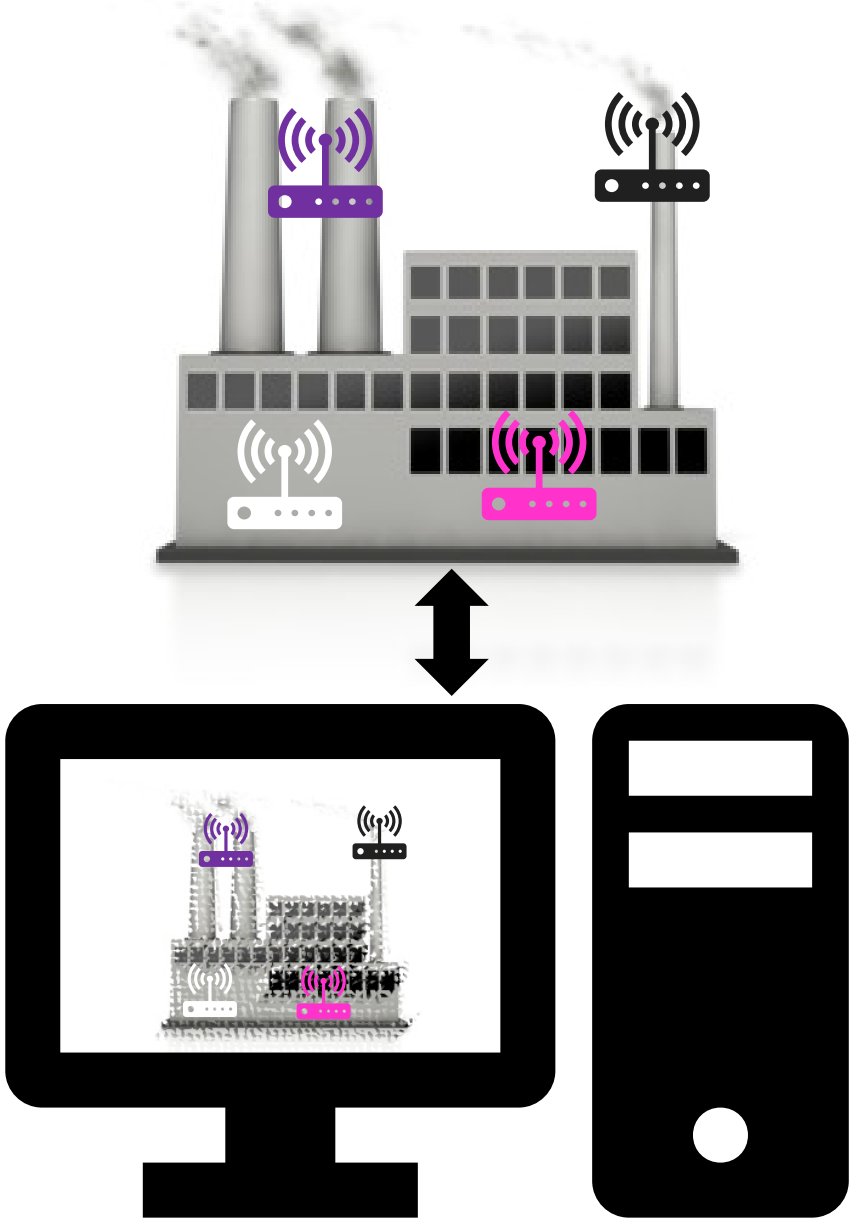

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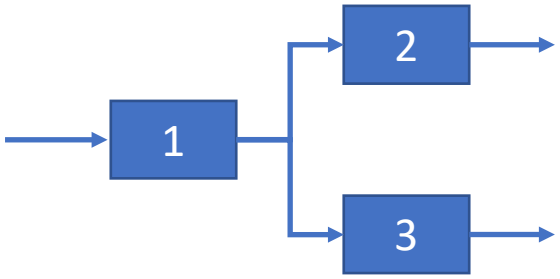

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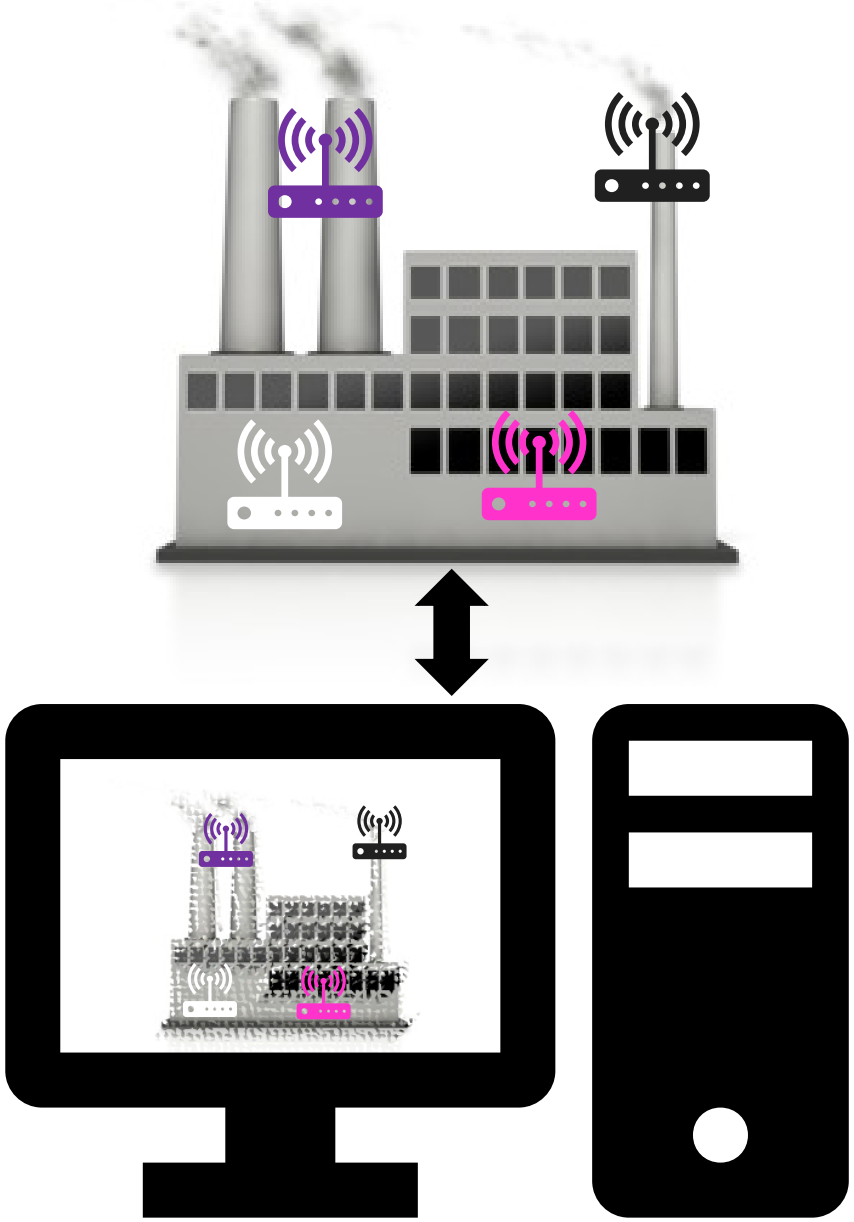

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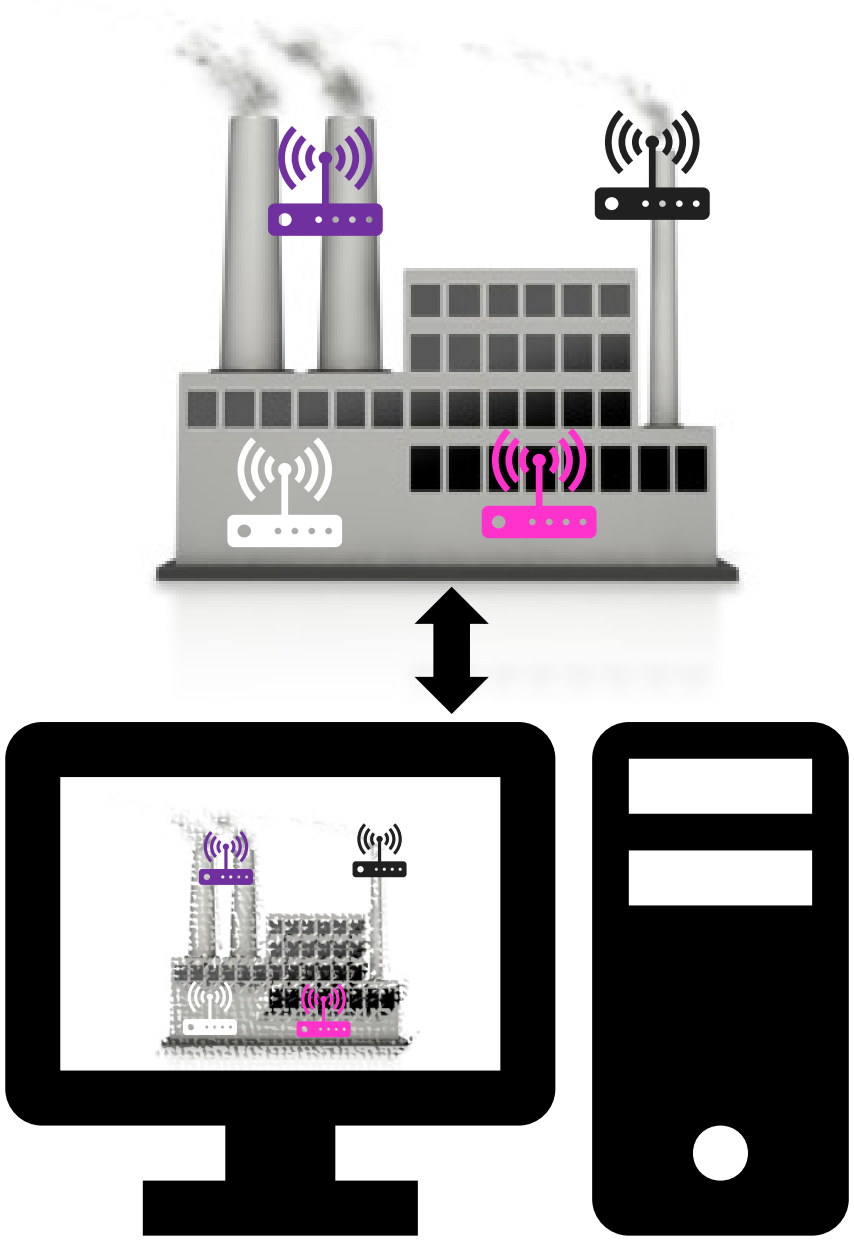
Summary



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Model Prediction	$\bar{x}$	s^2
Power	1001.3	20.1