VADER: Visualization and Analytics for Distributed Energy Resources

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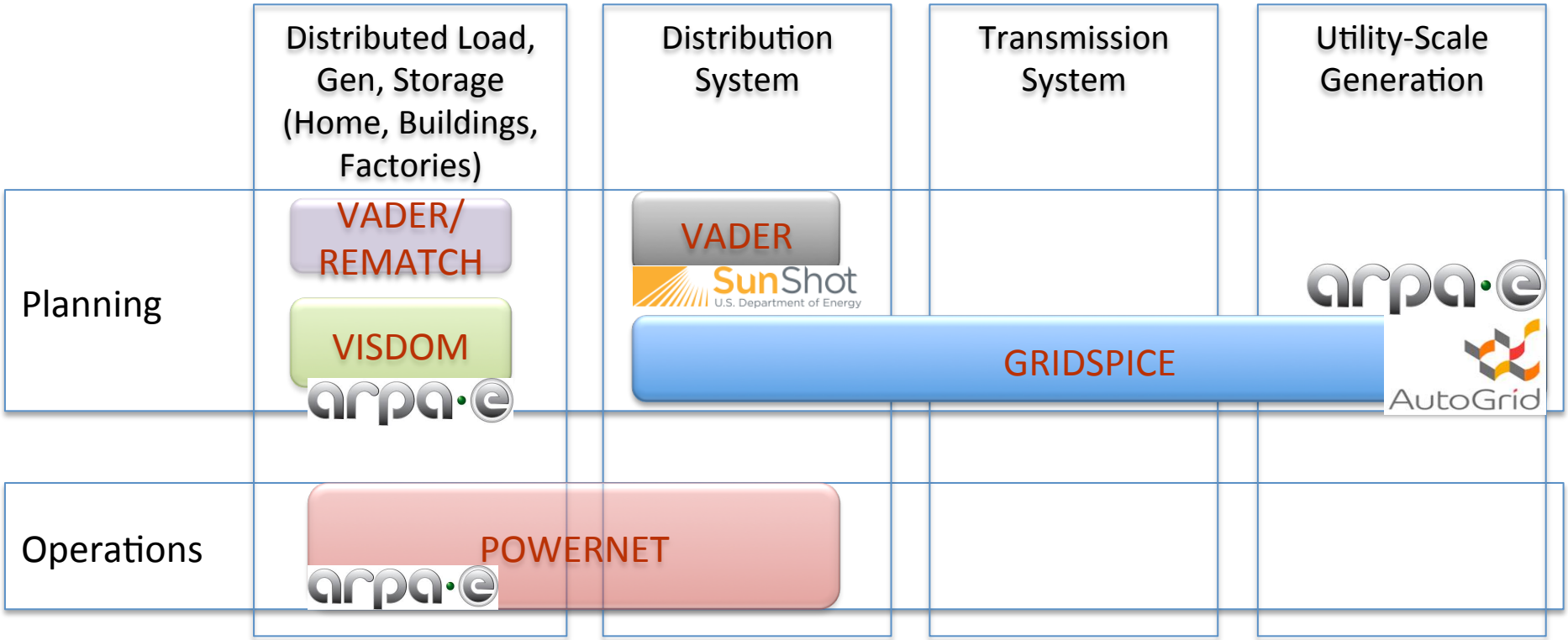
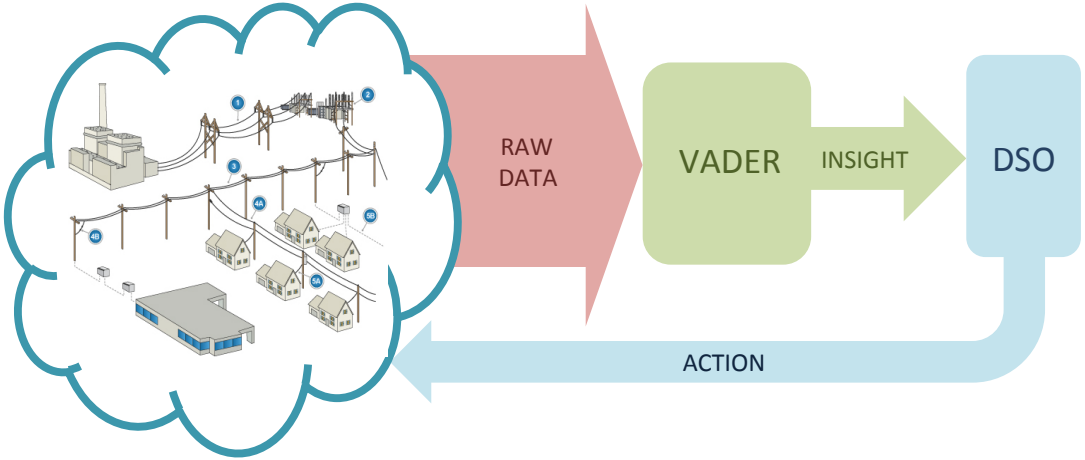
Projects at Stanford and SLAC



How to plan and monitor distribution systems with deep penetration of Distributed Energy Resources?

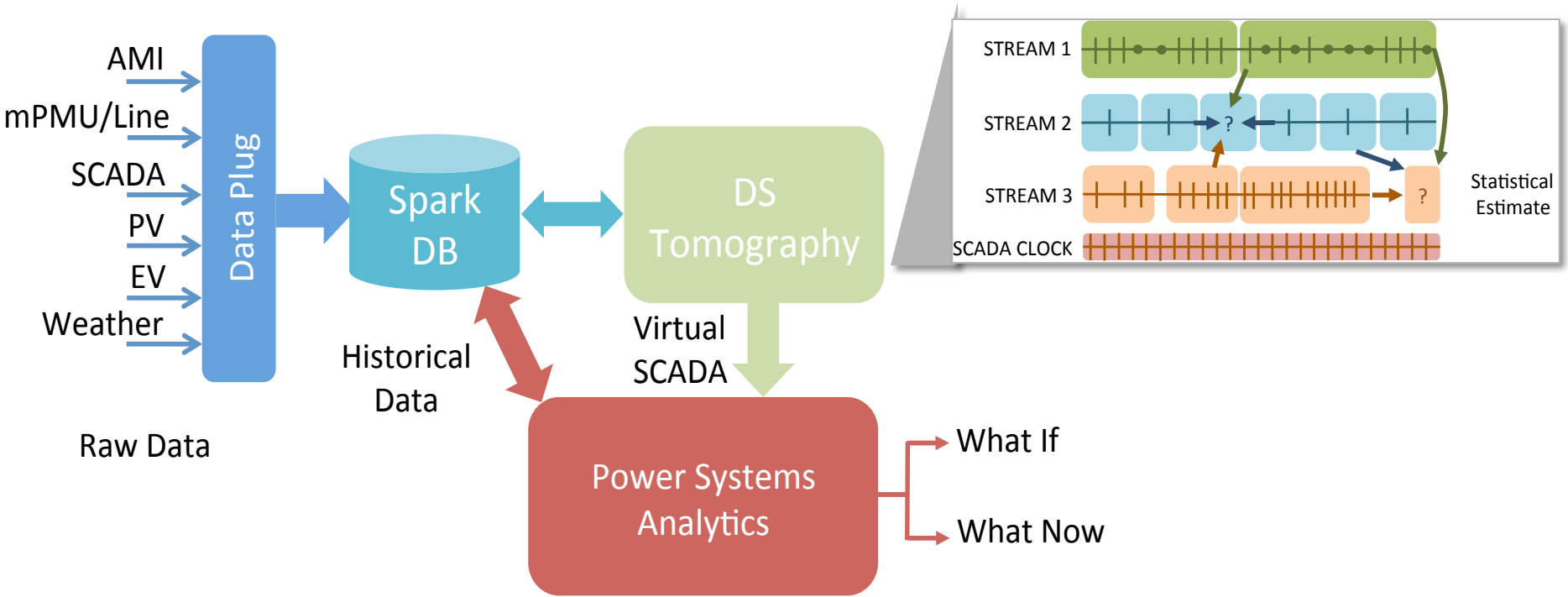


- Situational awareness [What now?]
- Operations planning [What if?]
- Impact evaluation of different technologies
- Closing the loop: resource placement, optimizing controls

Important goals

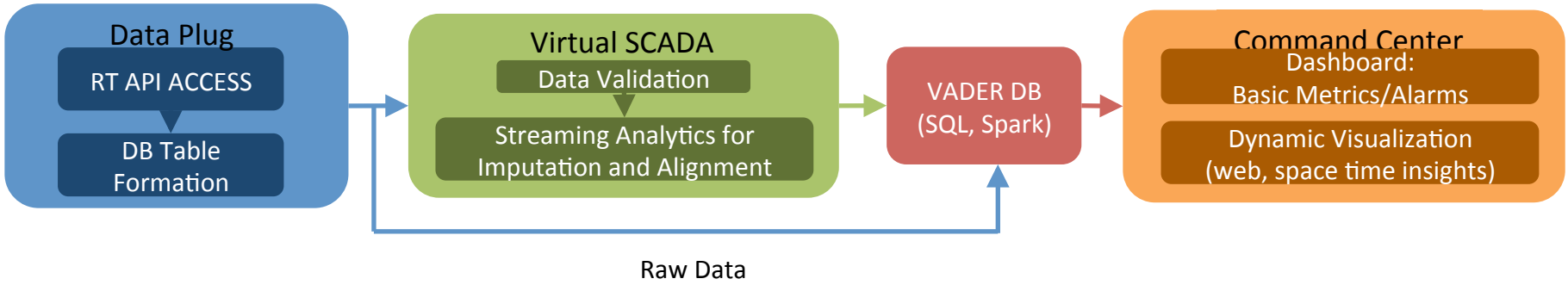
- Integrate large number of "high-resolution" and heterogeneous data sources
- Define a broad set of industry, utility and research driven use cases
- Embed existing tools and QSTS capabilities
- Validate the platform utilizing a pilot Hardware-in-the-Loop (HIL) testbed
- Demonstrate tools using data from industry and utility partners

System Architecture



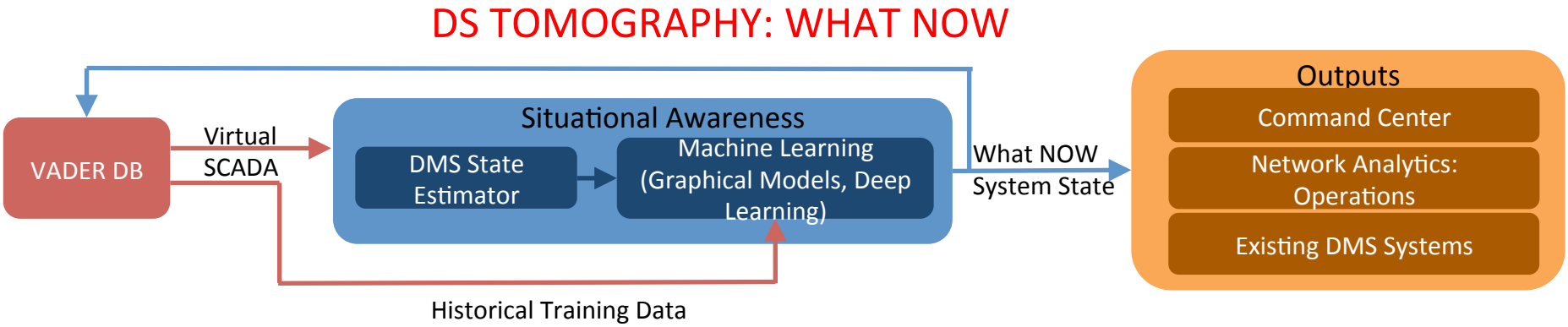
- Complemented by Hardware in the loop simulations (Opal-RT), Visualization

Data Streaming



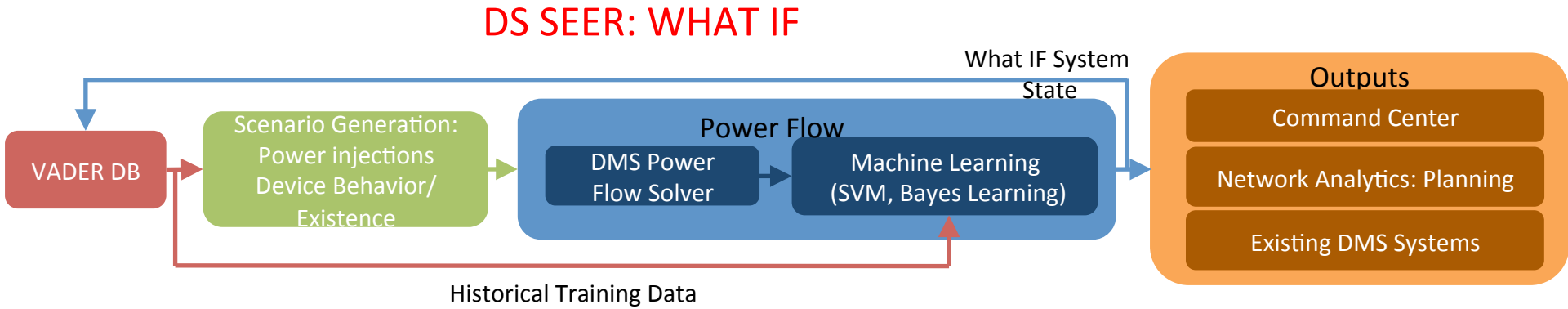
- Cleanse and normalize data to form Virtual SCADA
- Select, compute and predict useful operation metrics for feeders
- Temporal, spatial and statistical visualization

What is the state the of system now?



- Situational awareness in near-real-time utilizing high-resolution data
- Calculate state and topology information & optimal set points
- Utilizes machine learning to learn unmodeled dynamics
- Outputs compatible with existing DMS systems

What would happen to the system if?



- Scenario analysis utilizing high-resolution data and consumer behavior to enable risk aware planning
- Calculate solutions for power flow and connect to simulation
- Utilize machine learning to capture consumer behavior and unmodeled elements
- Optimize device selection and placement and control rules

Success metrics

- Can we support number rooftop PV penetration > 100% peak load in the feeder?
- Can we improve DER planning to reduce interconnection costs and times?
- Can we enable power sharing while ensuring reliability?
- Did the industry adopt (parts of) the open source platform?