AN EDGE COMPUTING SIZING TOOL FOR ROBOTIC WORKLOADS

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MOTIVATION

- Advancement in automating physical labour-intensive work
- Industry 4.0 vision: Automate High-Mix, Low-Volume productions
  - Present adaptation problems for future robotics
- Deployment of such strategies are limited by current deployment strategies and computing resources
  - New equipment, data storage and data processing

STATUS QUO

- Most robots are equipped with minimal resources
  - Performing lightweight static instructions
- I4.0 visions imposes fluidity in production
  - Introducing data-driven processes
- Current practice, to avoid resource limitations
  - Acquire over-the-top hardware
    - Not cost-effective
    - Underutilised hardware

COMPUTING PARADIGMS

- Single Node Computing
- Cloud Computing
  - Move Data to the Cloud
  - Cloud Robotics
  - Wide Area Network (WAN) Dependency
    - High Latency
    - Low Bandwidth
  - Inherent Trust & Control Issues
- Edge Computing
  - Move Compute to the Edge
  - Less Network Congestion
  - Low Latency
  - High Bandwidth
  - Increased Trust & Control

BENCHMARKING METRICS

RESOURCE-BOUND METRICS

- CPU Utilisation
- Memory Utilisation
- Storage R/W
- Network Tx/Rx
- Energy Consumption

WORKLOAD-BOUND METRICS

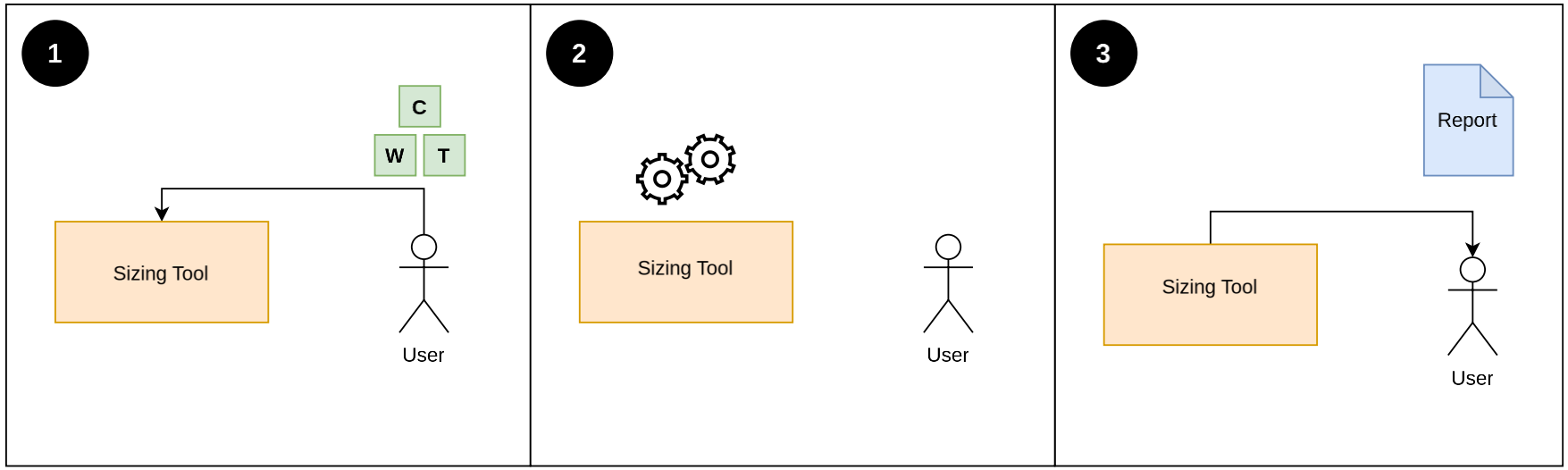
- Accuracy
- Precision
- Throughput
- Max Concurrent Connections
- Processing Latency

SIZING TOOL

- Statical evaluation of Workload against pre-written Testing Task
  - Evaluating Quality Attribute per requirement
- Evaluation on numerous hardware configurations
- Determine optimal hardware configuration
  - Ensure intended QoS
- Reduction in initial and operation costs

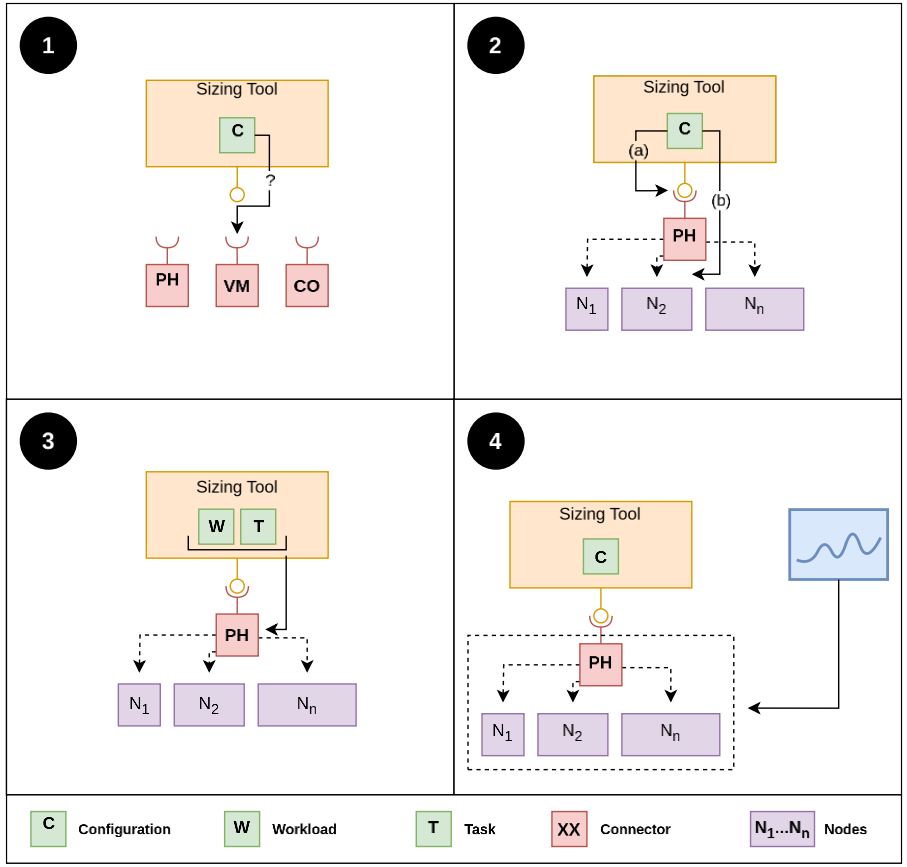
SIZING TOOL

1. Submit Workload, Testing Task and Configuration
2. Sizing Tool Runs Benchmarking
3. Sizing Tool Composes Benchmarking Report



SIZING TOOL

1. Select Connector
2. Select Hardware to Evaluate
3. Deploy Workload and Testing Task on Infrastructure
4. Monitor Metrics



FUTURE WORK

- Incorporating proposed methods into production-grade deployment frameworks
- Dynamical Metric Assessment to introduce high availability and autoscaling
  - Using input metrics other than resource-bound metrics

THANKS FOR YOUR ATTENTION

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