KEYSIGHT

Accelerating EDA Innovation: HPC Cloud-Driven Solutions to Slash Simulation Time

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Objective

Introduction to Keysight Design Cloud to enable significant simulation time reduction and explore ancillary benefits that Keysight Design Cloud offers to facilitate a parallelized workflow.

Agenda

- Define Terms
- Keysight EDA Design Cloud Parallelization
- Keysight EDA Design Cloud Environments and Broader Benefits

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Terminology

- **HPC** – high performance computing – The aggregation of computing power to speed up the solution of advanced computational problems
- **Cluster** – group of dedicated computers networked together
- **Job** – a job is simply a simulation
- **Job Scheduler** – a software program that manages the execution of jobs on a cluster based upon resources available (e.g. cores, memory) and any policies declared by the CAD team who manages the cluster

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- **Keysight EDA Design Cloud Parallelization**
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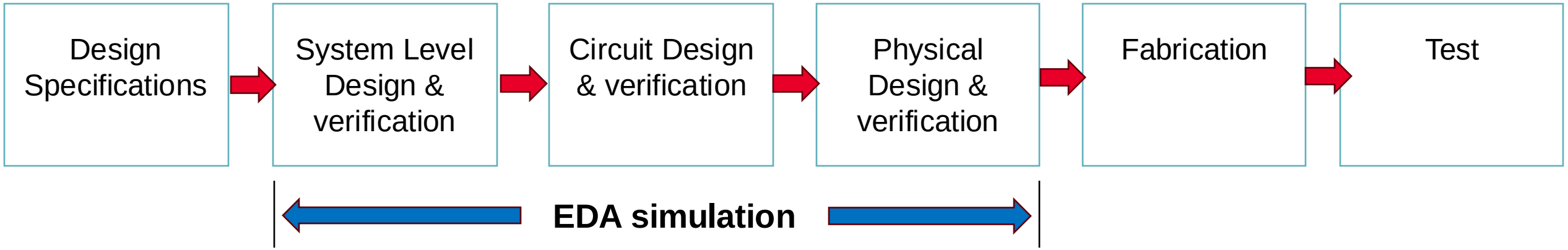
Realities Of Product Development

- Aggressive Time-to-Market requirements
  - Shorter Product Development Cycles
- EDA Simulation is an indispensable, necessary, and large part of product development
- More complex designs requiring longer simulation times and larger solution spaces
- Failed verification steps could lead to lengthened product development timelines
  - Missing Time-to-Market!



Keysight EDA Design Cloud

Keysight Design Cloud enables reduction of simulation time up to 80%* through parallelization

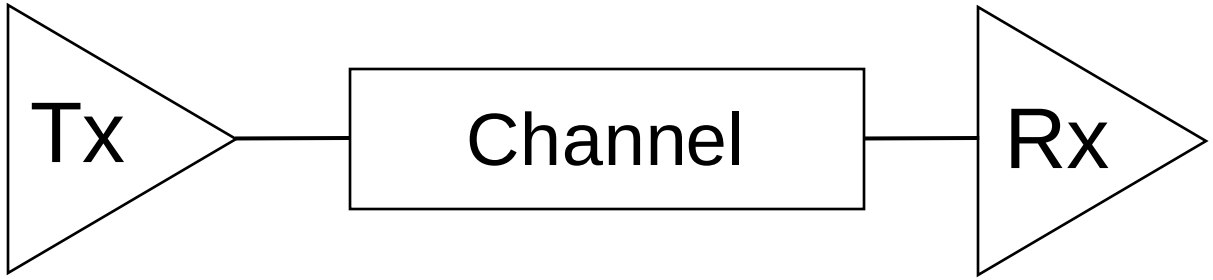
Parallelization enables users to

- **Circuit (W3029) – Concurrently simulate** the same circuit across
  - A set of parameters
  - A set of data files/netlists
  - A set of Random Variables/data files/netlists to perform statistical Monte Carlo analysis

- **EM (W3039)** – **concurrently simulate** the same physical layout across frequency points.

* Your mileage will vary - Hardware options will dictate the number of parallel jobs that are possible.

Keysight EDA Design Cloud – HSD Circuit Simulation

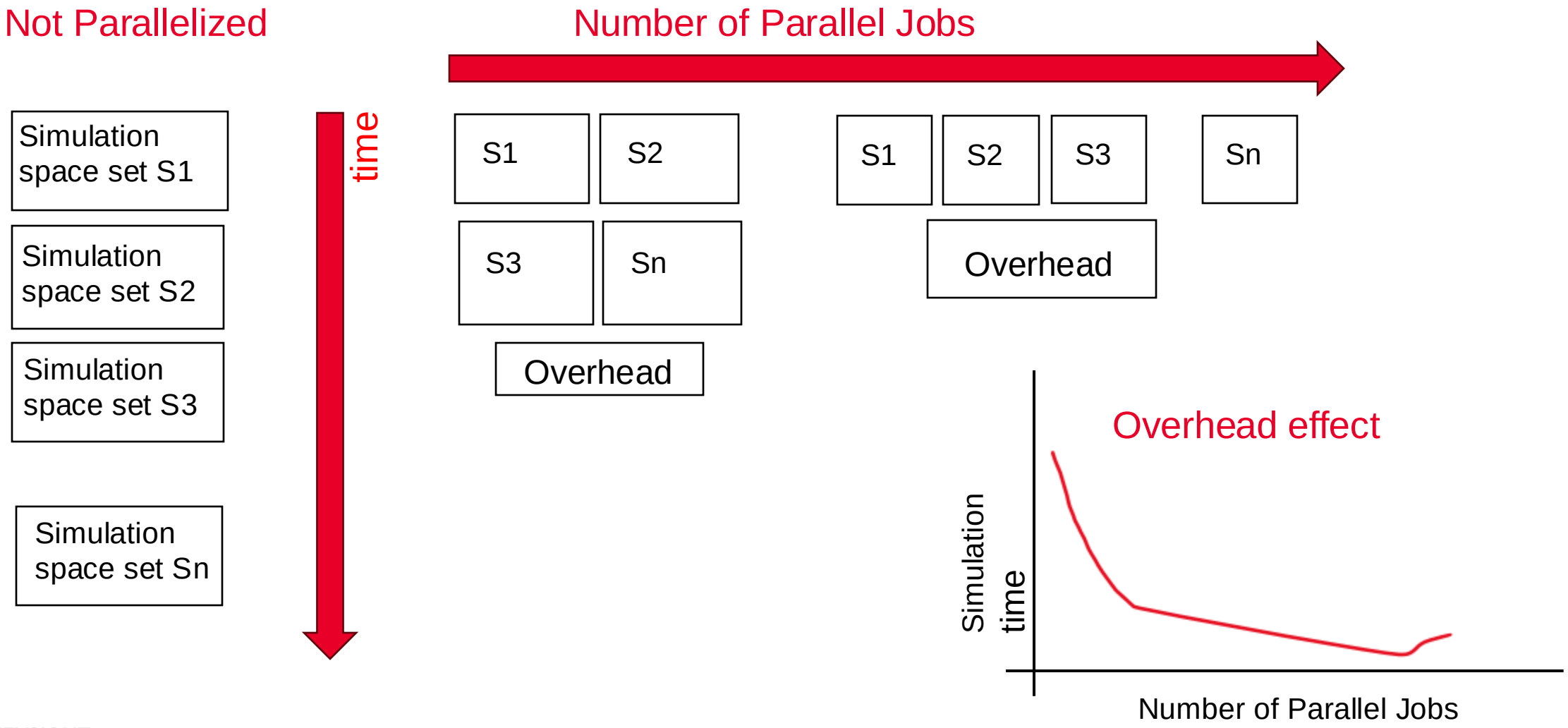


Simulation Space

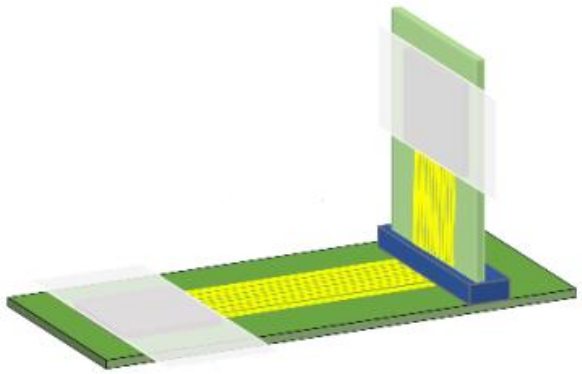
- Various Channels
- Tx Equalization Parameter#1
- Tx Equalization Parameter#2
- Tx Equalization Parameter #n
- Various Data Rates
- Rx Equalization Parameter#1
- Other Parameters
- Rx Equalization Parameter#2
- Rx Equalization Parameter #n
- Read/Write Bi-directional
- ODT Setting
- Simulation Corners

Keysight EDA Design Cloud – HSD Circuit Simulation

Un Parallelized vs. Parallelization



HSD Benchmark – Simulation Time vs. Number of Parallel Jobs

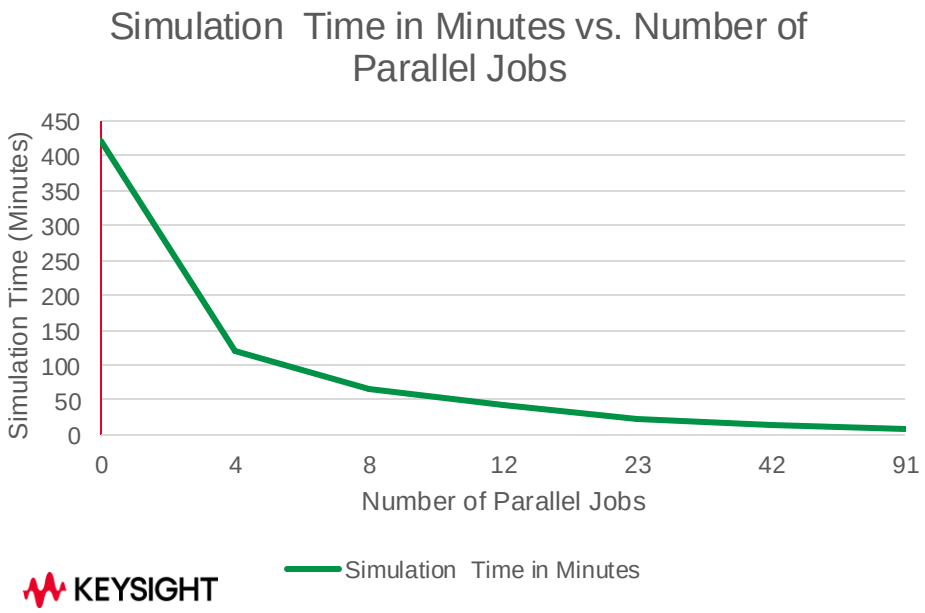


PCIe 6.0 Channel sim over Rescale Cluster with 8 threads per Job

- Simulation Space = 90 settings
- 6 Channels with Crosstalk
- Data Rate=64 GTPS
- 1.2 GB dataset

Rescale Cluster "Luna" option

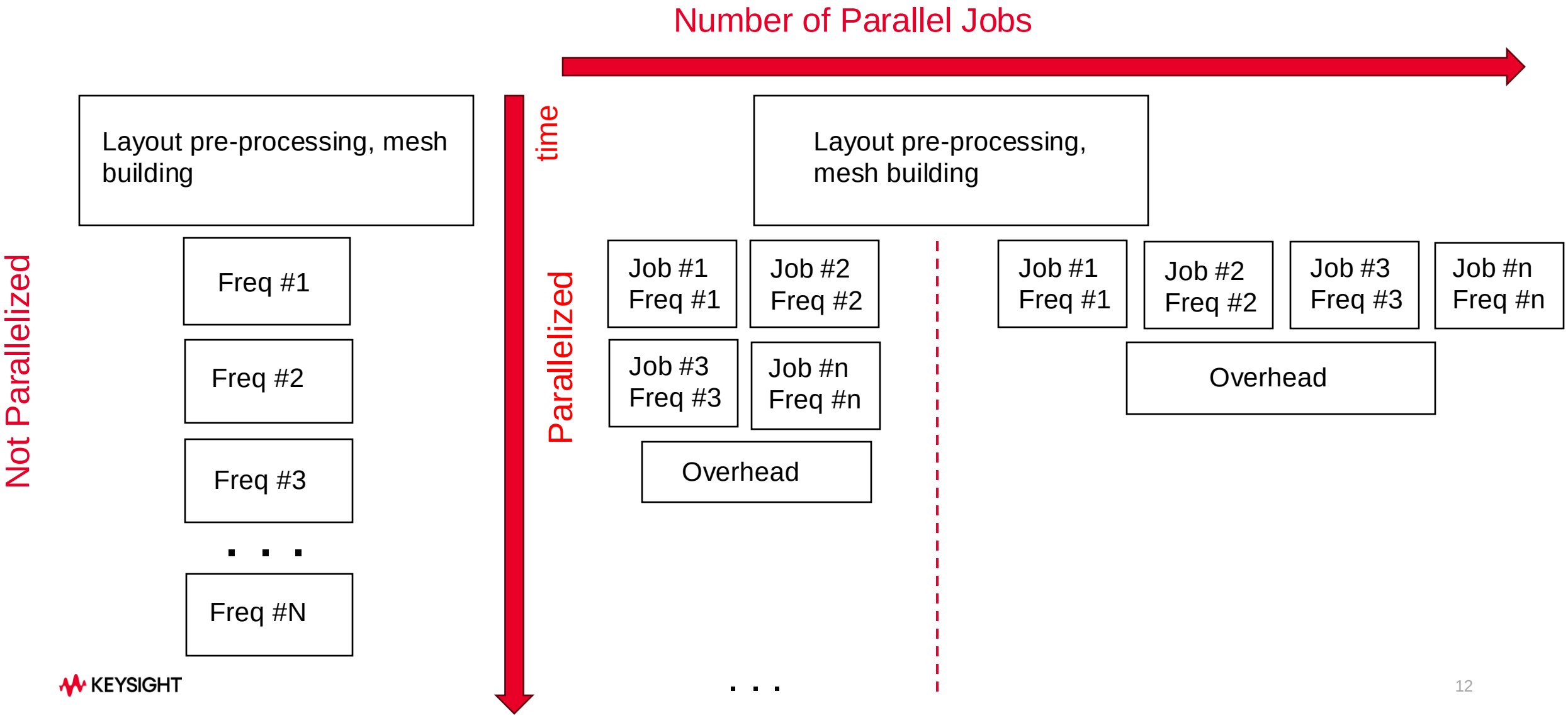
- 2nd Gen. Intel Xeon Processor
- Cascade Lake family
- Processor Base – 2.3 GHz
- Turbo Boost - 3.8 GHz



Number of Parallel Jobs	Simulation Time	Simulation Speed up
90	8 min	52X
45	13 min	32X
23	23 min	18X
12	42 min	10X
8	65 min	6.5X
4	120 min	3.5X
0	7 hours	N/A

Keysight EDA Design Cloud – EM Simulation

UnParallelized vs. Parallelized - EM Simulation Per Structure



Xilinx Zynq ZCU Evaluation Board

CHALLENGE

Capture all DDR4 Data Lines, Data Strobes, and Data Masks

88 Signal Nets – 16 Layer PCB

Simulation Freq range of DC-10GHz

44 Freq Points & 176 Ports

SOLUTION

SIPro within PathWave ADS
16 Parallel Jobs

16x 48-core 192GB RAM Luna nodes on Rescale Cloud HPC Platform

RESULTS

Desktop 6 Core (i9)
14 Hours 50 mins

Rescale 2 Parallel Job Sim Time
6 Hours 08 mins

Rescale 16 Parallel Job Sim Time
0 Hours 48 mins

18X Acceleration

2.4X: Desktop → 2 Cloud HPC Jobs
7.7X: 1 HPC → 16 Cloud HPC Jobs

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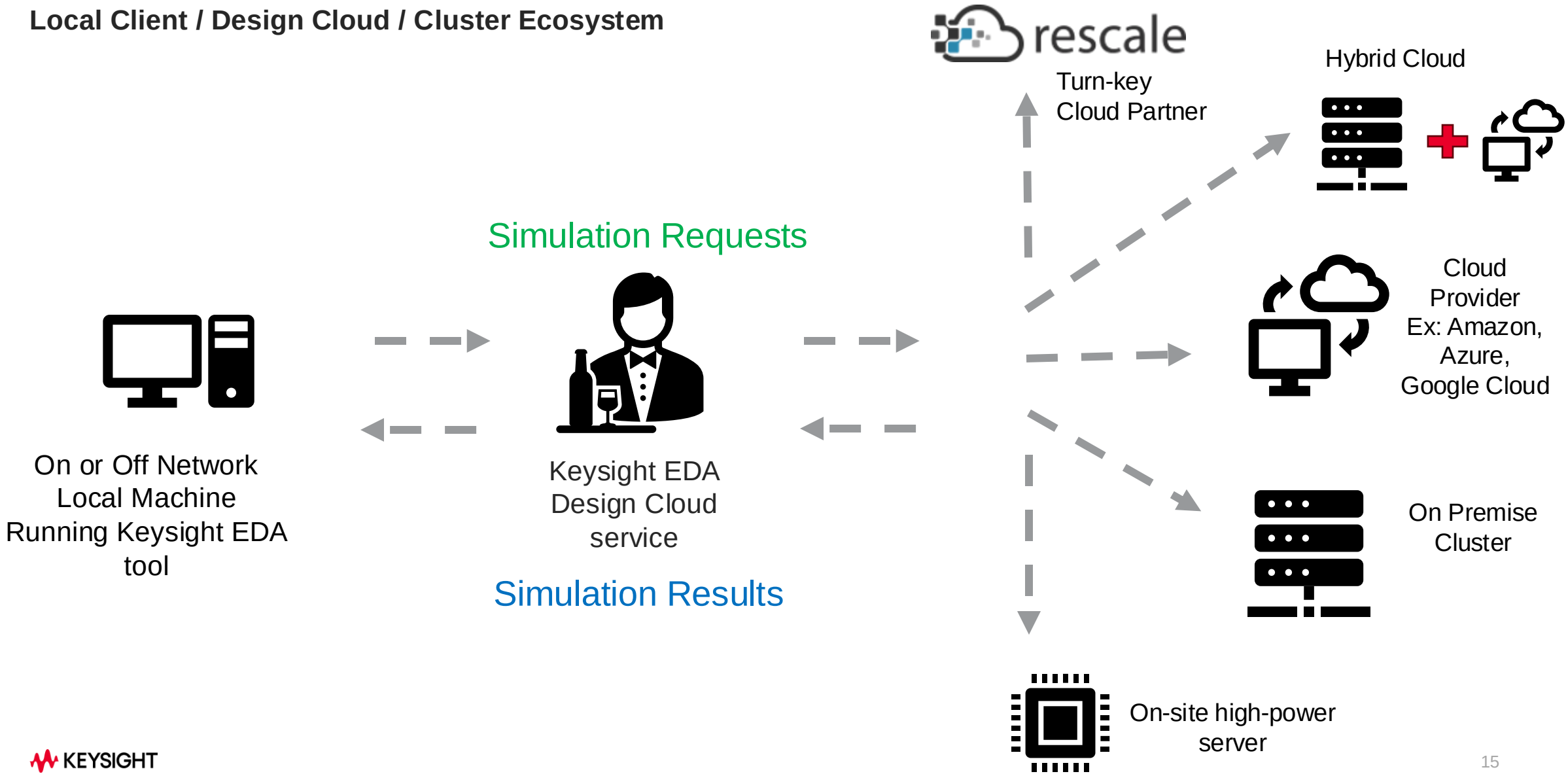
Keysight Design Cloud Environment

Local Client / Design Cloud / Cluster Ecosystem



Keysight EDA Design Cloud – Broader Benefits

- Up to 80% simulation time reduction – dependent upon several factors:
  - The size of simulation problem itself
  - Cluster variant
  - Hardware resources available
  - Network speeds
  - Security tools/policies
  - Results data aggregation
- Queued simulations: You can queue up multiple parallel and nonparallel simulations… parallel simulations do not have be launched in serially
- Simplistic Parallelized Licensing – Licensing per job, not per hardware resources consumed

  W3029 - PathWave Ckt Sim HPC 1-pack (All Circuit Engines)

  W3039 - PathWave EM HPC 1-pack (All EM Engines)

Keysight EDA Design Cloud – Broader Benefits Continued

- Detachment: You can run simulations, close the local machine, open the local machine later and simulation results are automatically downloaded
- Cross Platform support – Windows client to Linux cluster, Linux client to Windows cluster
- Web based dashboard to see simulation status and summaries
- Authentication and secure HTTP (HTTPs) enhancements available for elevated security when needed
- Design Cloud Lite subtype enabling fast enterprise level parallelized simulation deployment
- Python APIs – APIs available command driven parallel simulation
- Multiple simulation technologies supported: SystemVue (System Level), Electrothermal, and Quantum

Keysight EDA Design Cloud – Broader Benefits Continued

Sitecluster API

- Out-of-the-box support for many Job Schedulers found in the industry:

LSF	Altair Accelerator (NetworkComputer)
SunGrid/OpenGrid/Univa	HT Condor
SLURM	Microsoft HPC Pack
PBS/PBS Pro	

Cloud based schedulers:

AWS SOCA, AWS Parallel Cluster, AWS RES

Microsoft Azure: Azure Cycle Cloud

- User customizable to enable quick adjustment for supported cluster variants and open framework for the development & implementation of unimplemented cluster.

Summary

- Keysight Design Cloud provides a platform to significantly reduce simulation times up to 80%
- Parallelization possible with both Circuit, EM, and other Keysight EDA simulation technologies
- Cost effective per-Job licensing, not hardware based
  - W3029 - PathWave Ckt Sim HPC 1-pack (All Circuit Engines)
  - W3039 - PathWave EM HPC 1-pack (All EM Engines)
- Keysight Design Cloud Multiple capabilities for a fast and robust workflow experience
  - Queued simulations
  - Local machine detachment from cluster
  - Python APIs for command driven simulations
  - Open API with many industry leading Job Schedulers and ability to implement those not offered out of the box

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Thank you


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