

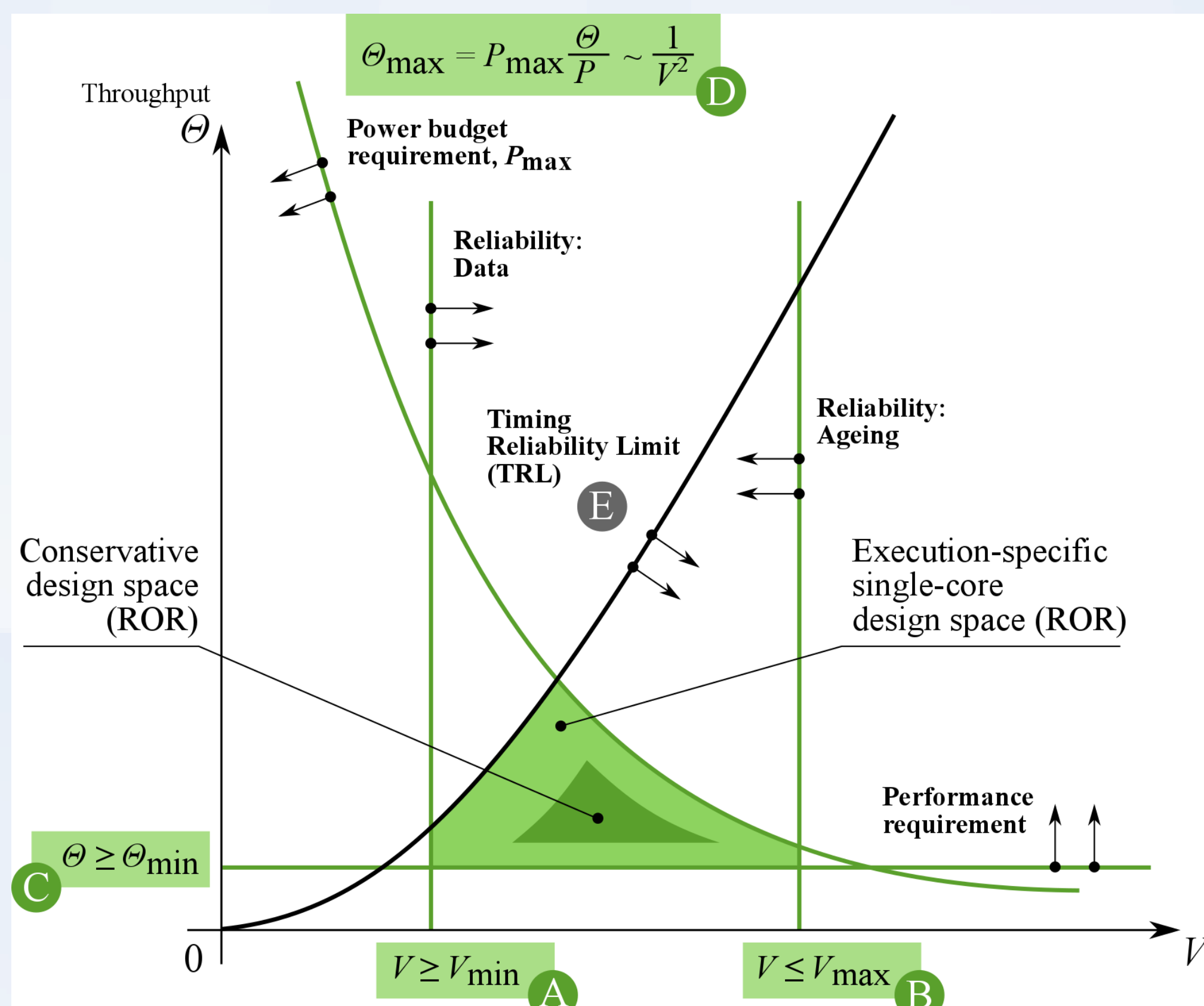
PER – Performance, Energy and Reliability

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Introduction

- Parallelization can help balance energy consumption and performance esp. in multi- and many-core systems
- The interplay between performance and energy and their relationship with parallelization scaling are studied with the help of the reliable operation region (ROR)
- Theoretical and experimental explorations
- Cross-platform analysis through bi-normalization of the ROR
- Online web tool captures the concept of this interplay and finds optimal operating points

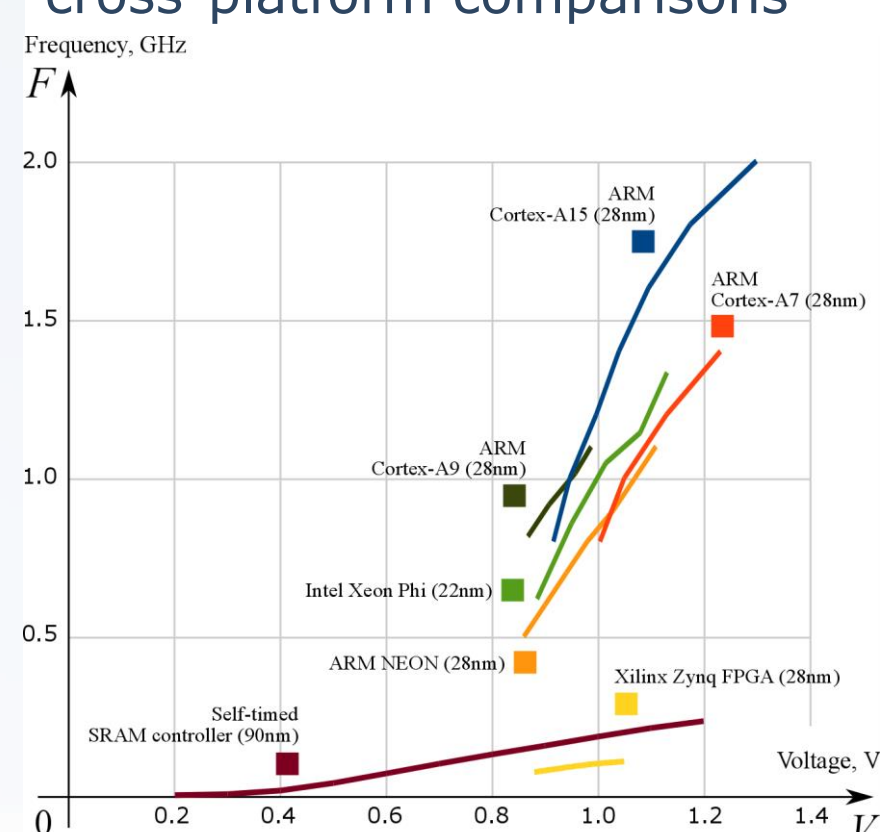
ROR



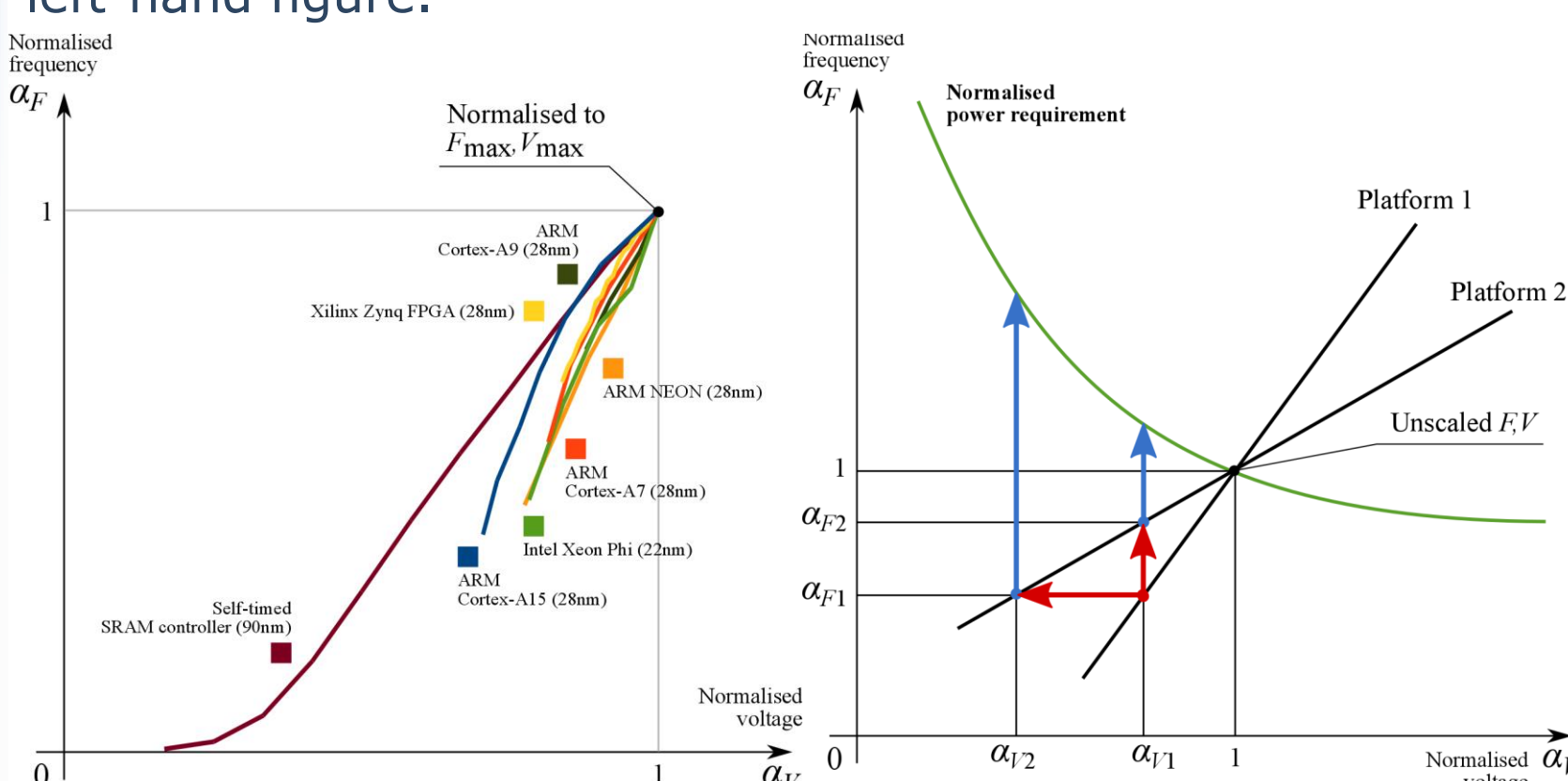
Low voltage limit A, high voltage limit B, throughput requirement C, power limit D, and timing reliability limit (TRL) E together form the boundaries of the ROR

Bi-normalization

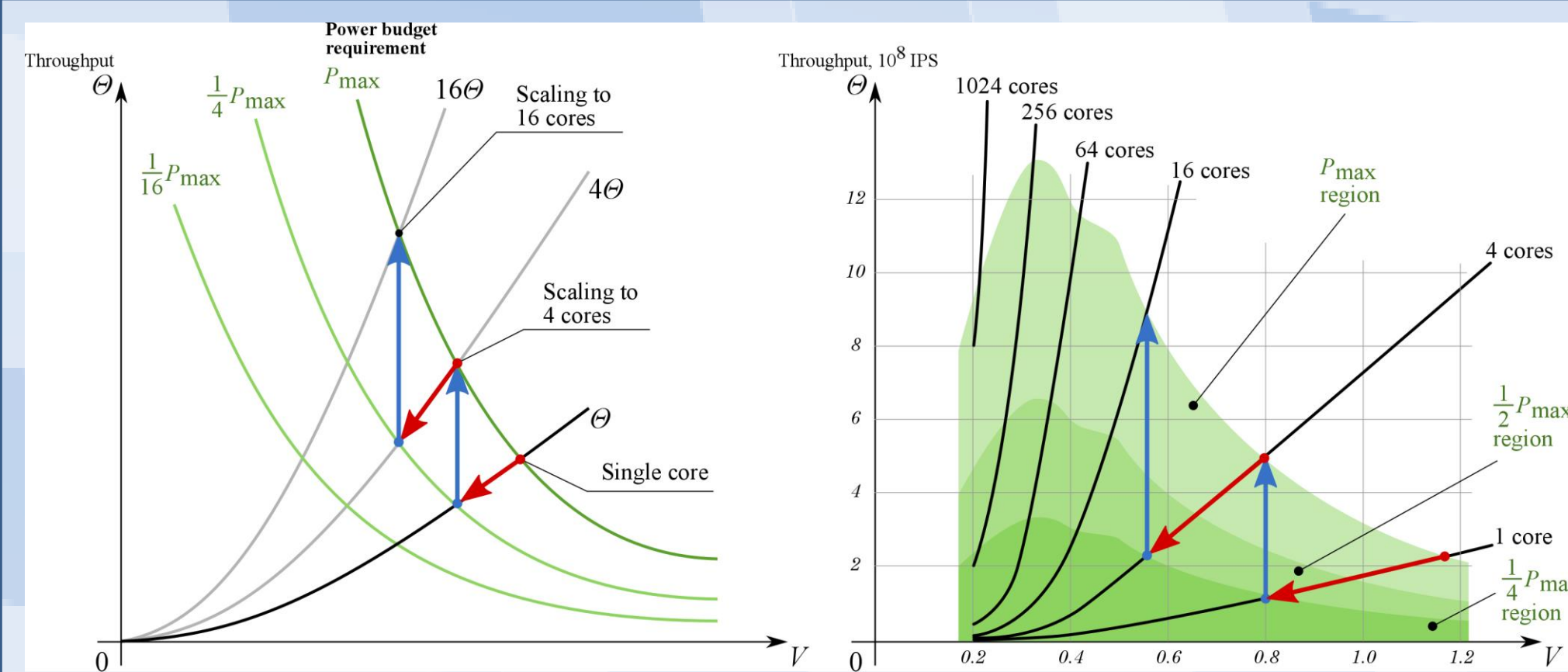
TRLs in the true value F/V space cannot be used for cross-platform comparisons



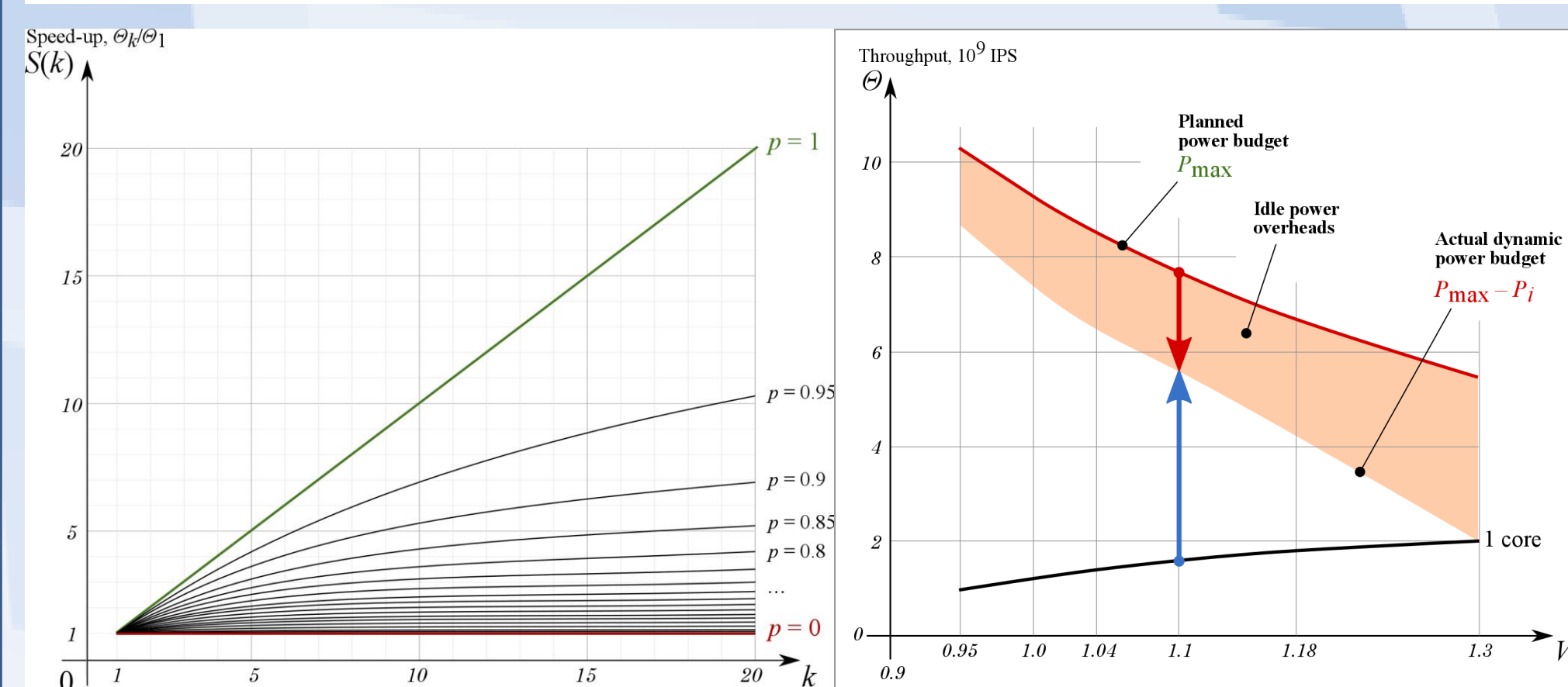
Cross-platform comparisons of the effectiveness of k -scaling is possible in the bi-normalized F/V space. This concept is shown in the right-hand figure and the data is shown in the left-hand figure.



K-scaling



Perfect k -scaling to theoretical switching power (left) compared to measured data, which pertains to total power (including leakage power).

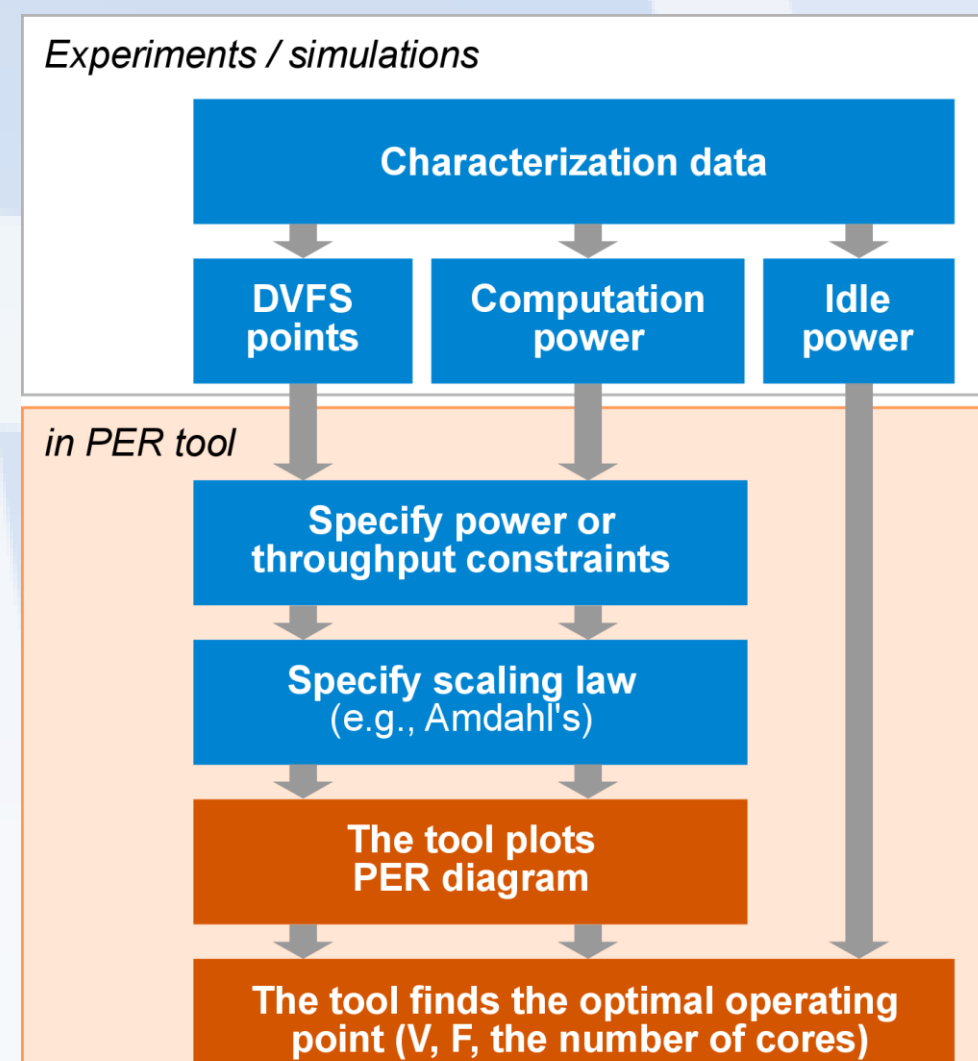


Perfect k -scaling is not possible as shown by Amdahl's law on the left, and idle power must also be considered as shown on the right.

PER tool workflow

The PER web tool can be used with pre-installed example data obtained from a number of platforms experimentally, or user-supplied data.

User-supplied data can be either from experimental characterization or from design specifications



Tool availability

URL:
<http://async.org.uk/prime/PER/>

