Architecting System Performance; Resource Management

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Abstract

The management of the resources largely determines system performance. This document discusses concepts related to resource management, such as caching, concurrency, and scheduling.

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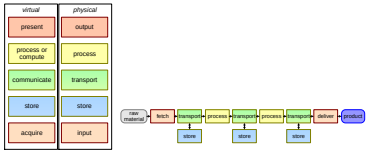
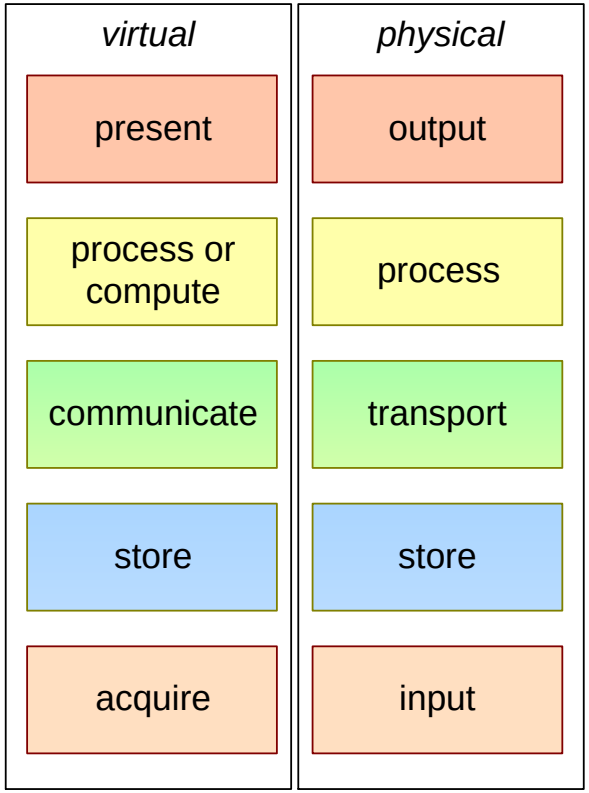
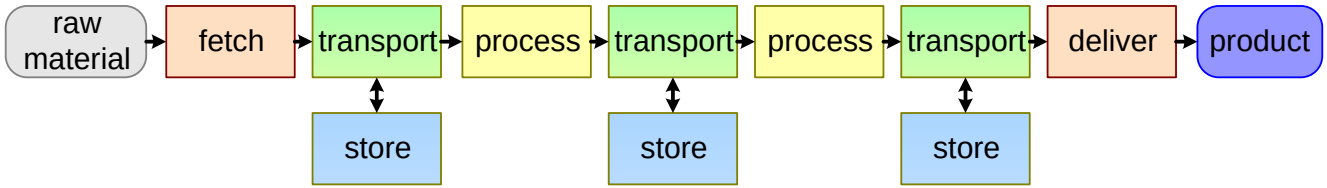


Generic Resource Model





Design Considerations for Resource Management

Performance depends on resource utilization and management.

The design of the logistics, how does EMI[1] flow through the resources, is critical.

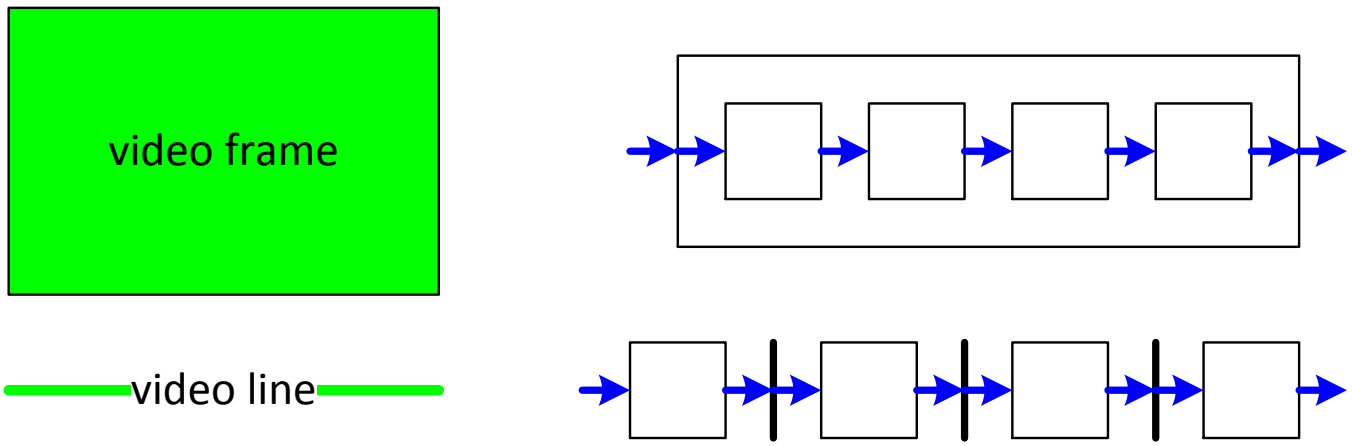
Critical design aspects are:

- concurrency (parallelism, pipelining)
- granularity of EMI
- scheduling (allocation of resources)

[1]Energy Material Information

Granularity as Key Design Choice

unit of buffering	== or <>	*unit of synchronization*	== or <>	*unit of processing*	== or <>	*unit of I/O*



- pixel

fine grain:	*coarse grain:*
flexible	rigid
high overhead	low overhead

Size versus Performance Trade off

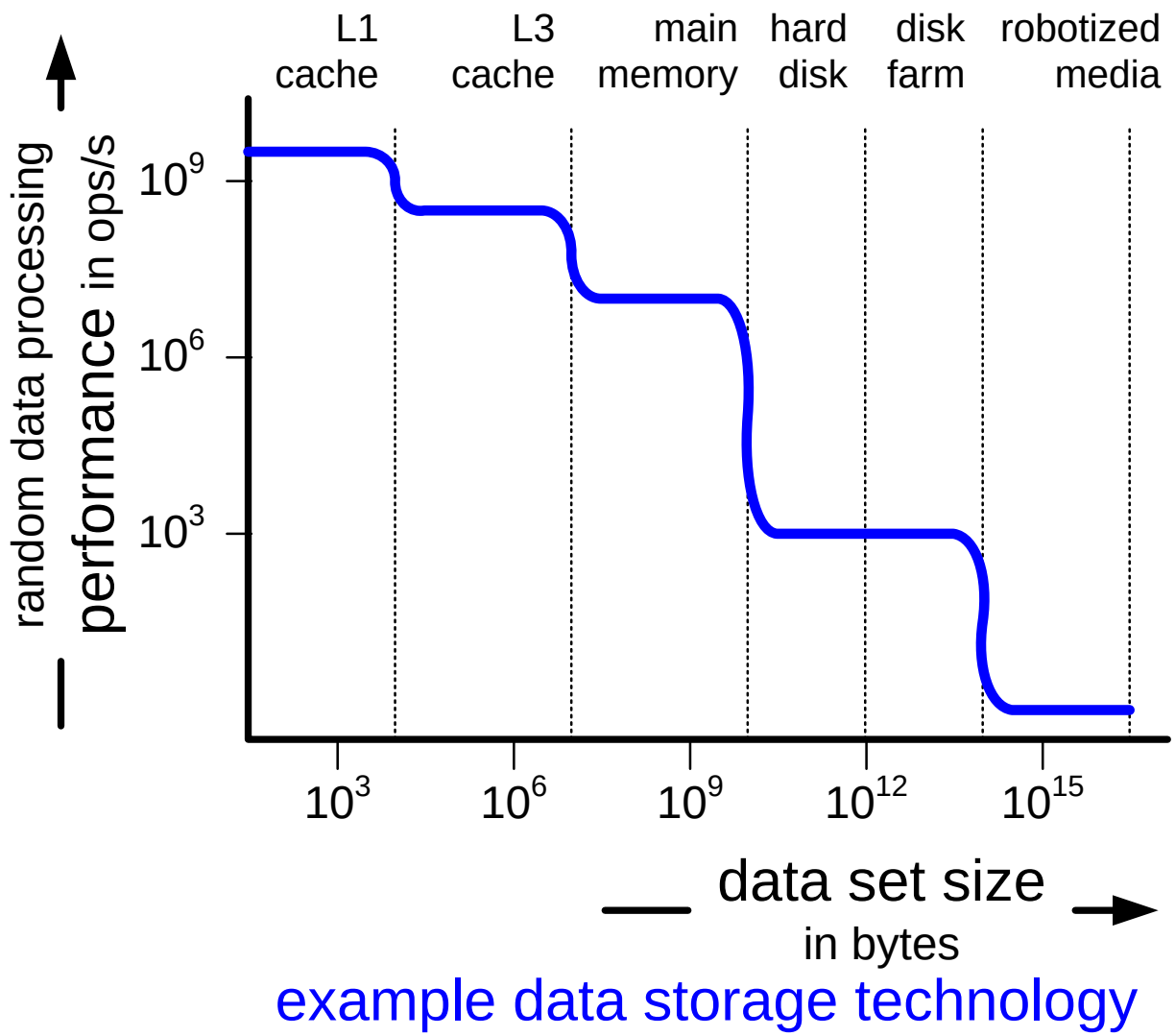
small capacity

fast technology
small
expensive

large capacity

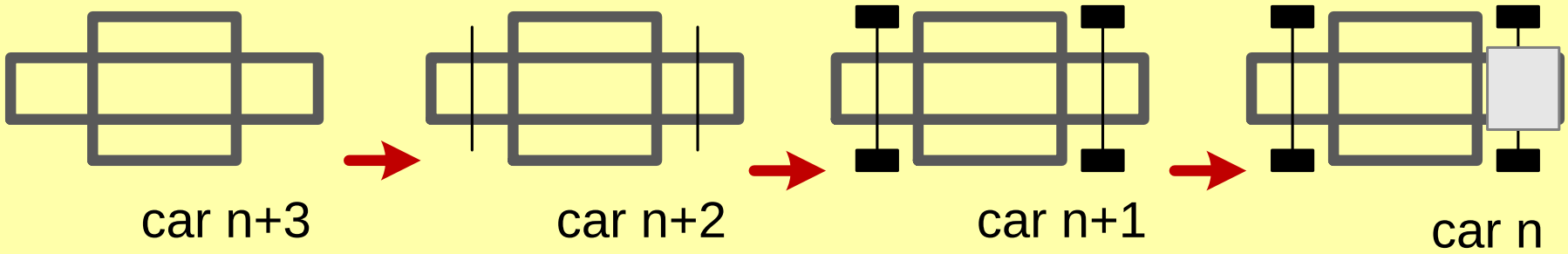
slow technology
large
low cost

staircase effect:
performance and size are non-linear with thresholds



Pipeline pattern

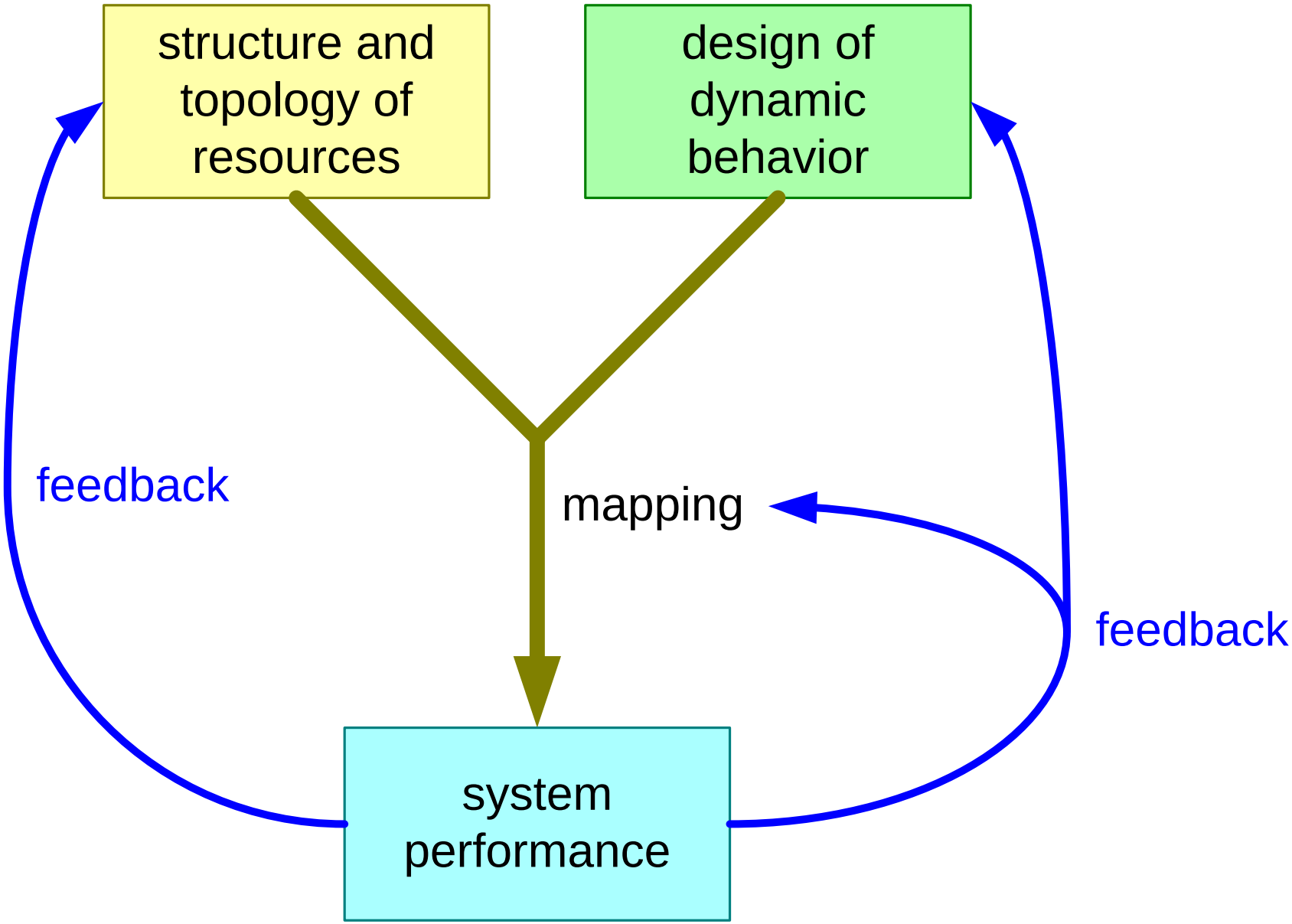
production line = pipeline



lean uses the notion of tact
f.i. every 10 minutes the products move to the next workspot

throughput = products/time
$t_{production\ 1\ car} = t_{in} - t_{out}$

Y-chart Pattern



Performance Pitfalls and Resource Management

Overhead (control, handling)

Starvation (underrun)

Saturation/stagnation (overrun)

Variation (duration, quality)

Serialization

Interference with other work

Unnecessary conversions or adaptations