Submethods in the CR Views

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Abstract

This chapter describes the *Conceptual* view and the *Realization* view. Both views are supported by a set of submethods to describe multi-disciplinary design, for example several decompositions and models are provided.

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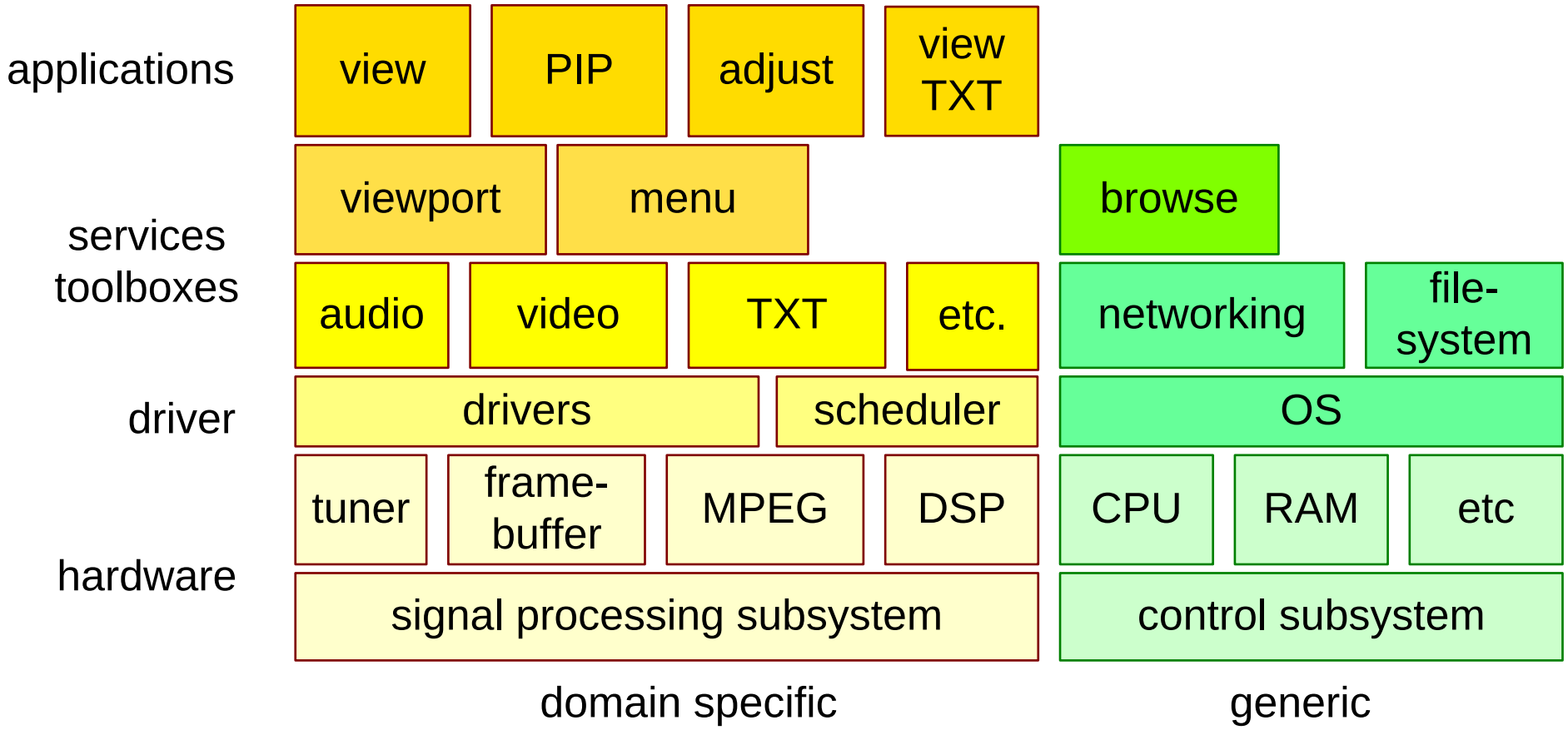
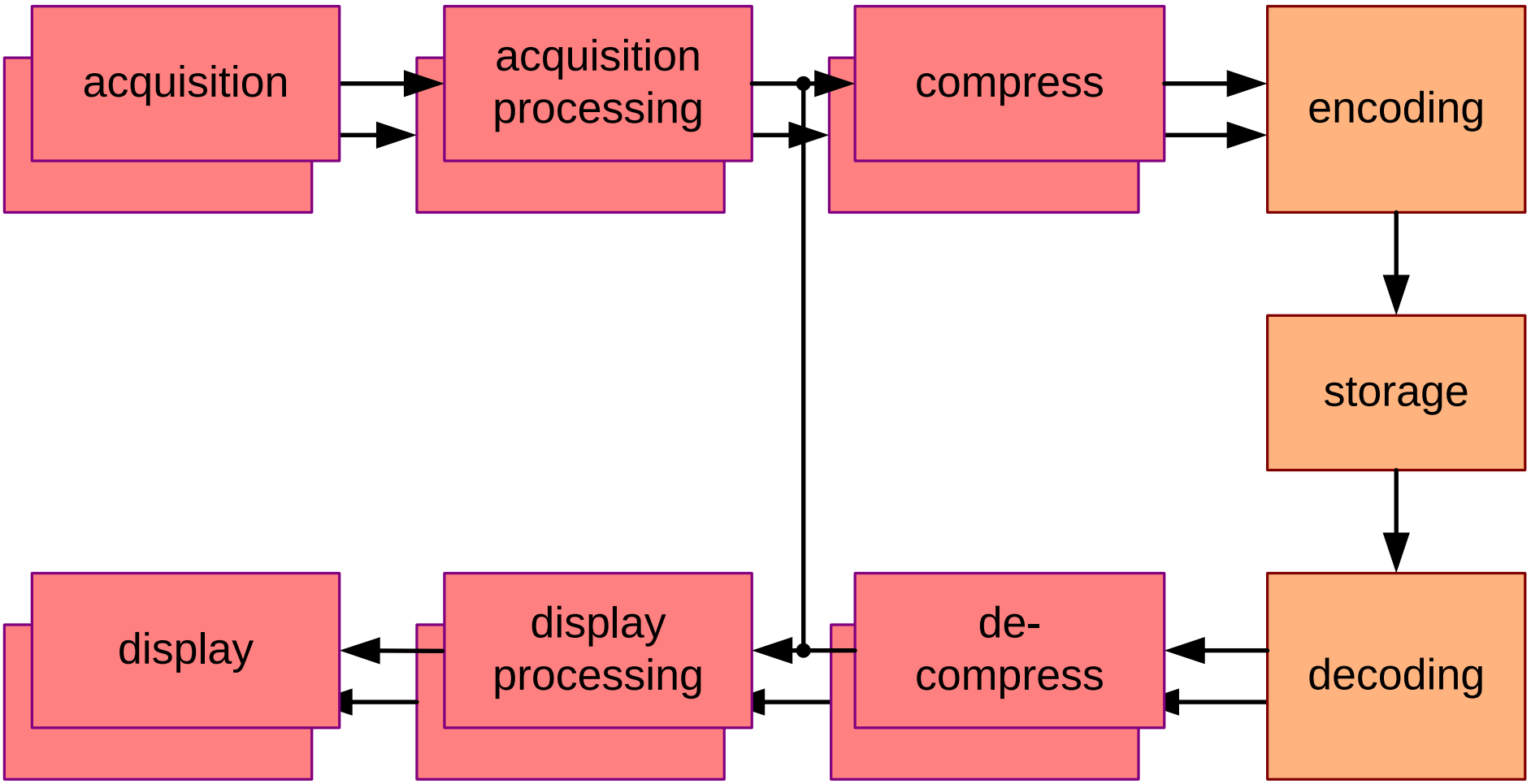
logo
TBD

Construction Decomposition



Functional Decomposition



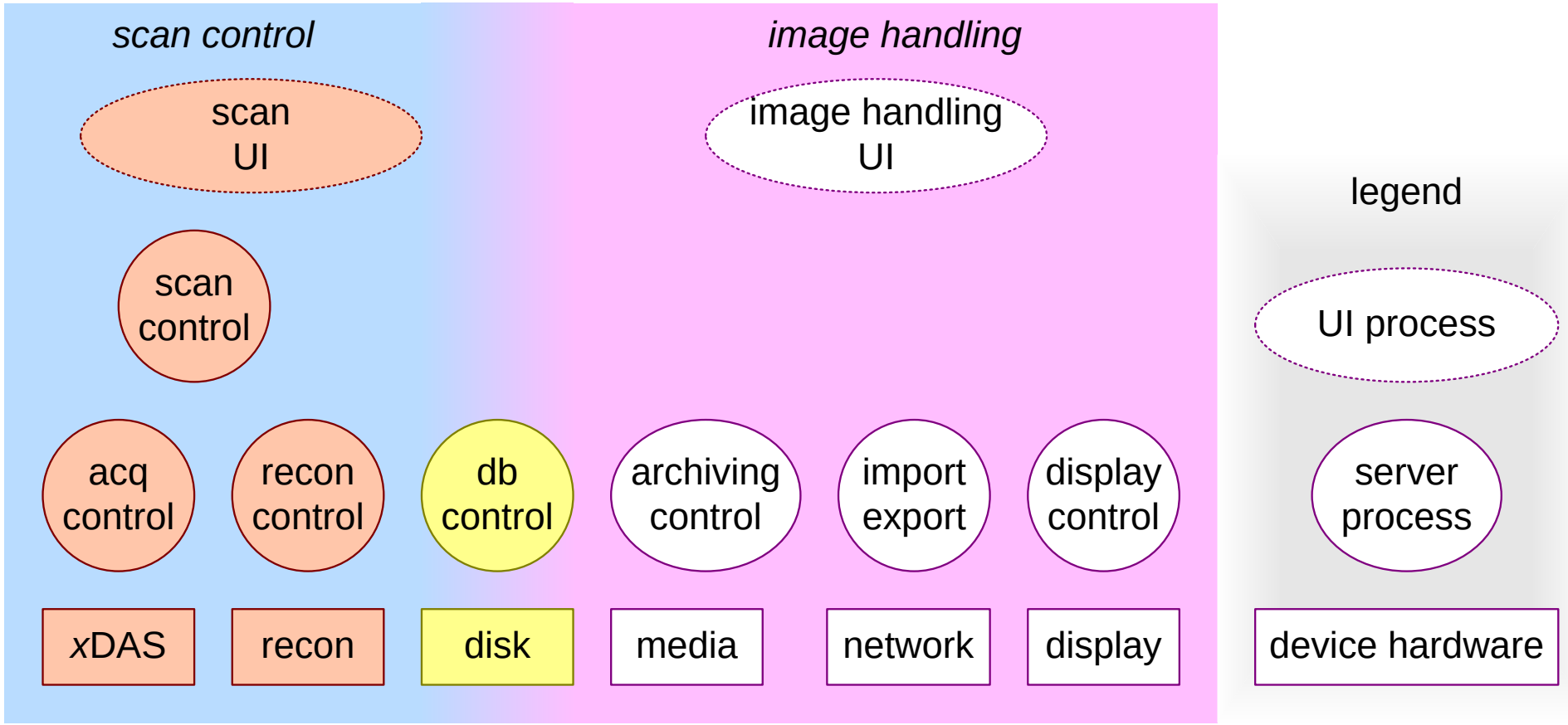
Question Generator

How about the **<characteristic>**
of the **<component>**
when performing **<function>**?

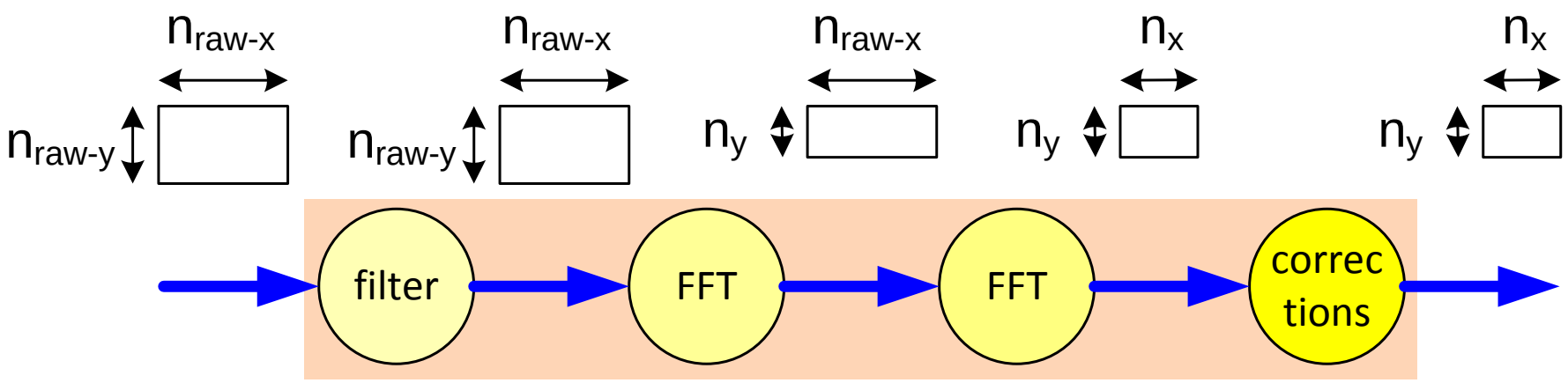
characteristics	SNR accuracy **memory usage** processing latency ...
components	import server, **user interface**, print server, database server, export server, ...
functions	**query DB**, render film, play movie, next, brightness, ...

What is the **memory usage** of
the **user interface**
when **querying the DB**

Process Decomposition



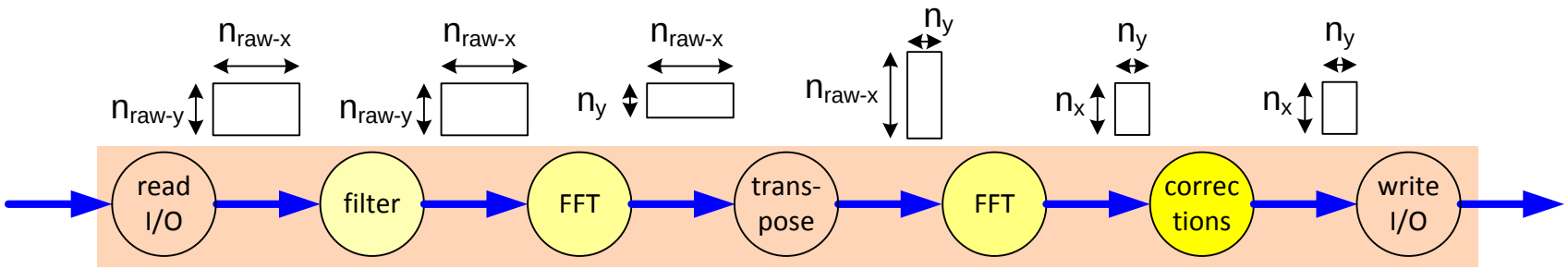
Conceptual Performance Model



$$t_{recon} = t_{filter}(n_{raw\text{-}x}, n_{raw\text{-}y}) + n_{raw\text{-}x} * (t_{fft}(n_{raw\text{-}y}) + t_{col\text{-}overhead}) + n_y * (t_{fft}(n_{raw\text{-}x}) + t_{row\text{-}overhead}) + t_{corrections}(n_x, n_y) + t_{control\text{-}overhead}$$

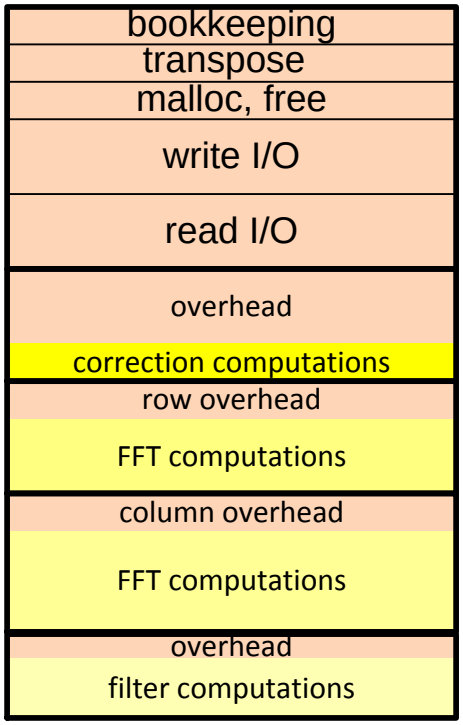
$$t_{fft}(n) = c_{fft} * n * \log(n)$$

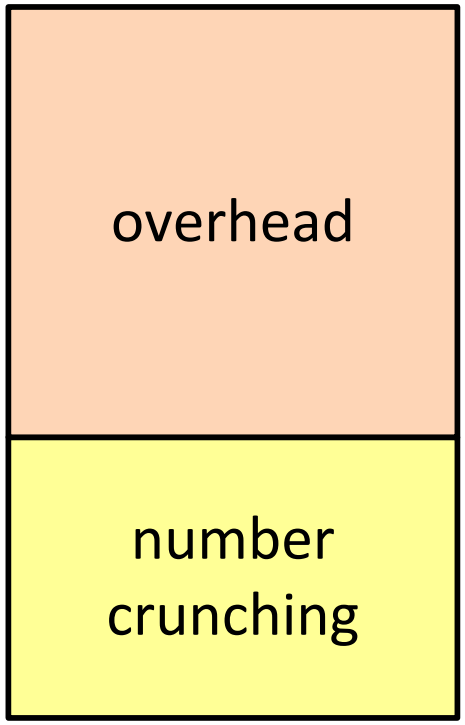
Model After More Detailed Performance Analysis



$$t_{recon} = t_{filter}(n_{raw-x}, n_{raw-y}) + n_{raw-x} * (t_{fft}(n_{raw-y}) + t_{col-overhead}) + n_y * (t_{fft}(n_{raw-x}) + t_{row-overhead}) + t_{corrections}(n_x, n_y) + t_{read\ I/O} + t_{transpose} + t_{write\ I/O} + t_{control-overhead}$$

$$t_{fft}(n) = c_{fft} * n * \log(n)$$





focus on overhead reduction

is more important

than faster algorithms

this is not an excuse for sloppy algorithms

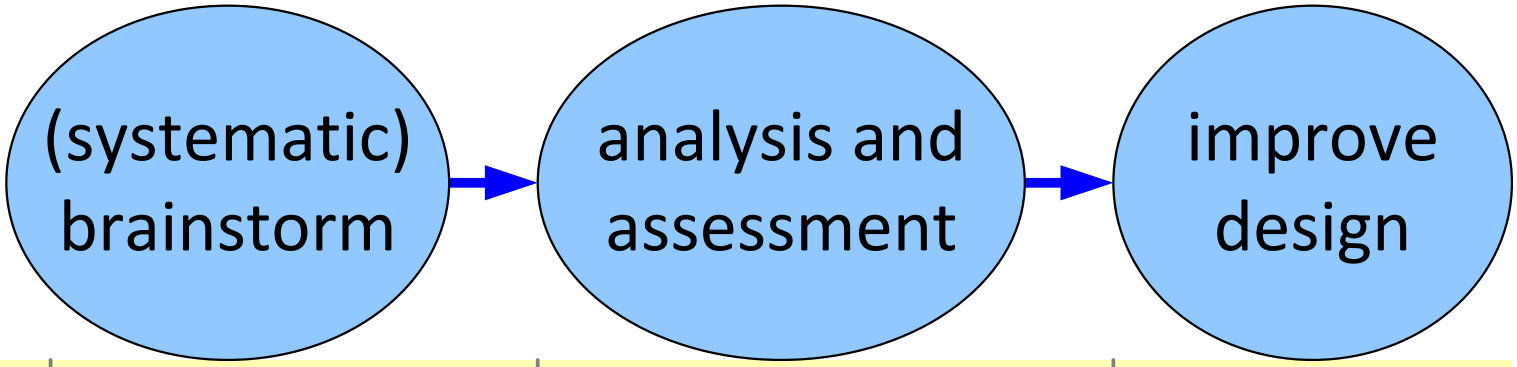
Micro Benchmarks

	infrequent operations, often time-intensive	*often repeated operations*
database	start session finish session	perform transaction query
network, I/O	open connection close connection	transfer data
high level construction	component creation component destruction	method invocation same scope other context
low level construction	object creation object destruction	method invocation
basic programming	memory allocation memory free	function call loop overhead basic operations (add, mul, load, store)
OS	task, thread creation	task switch interrupt response
HW	power up, power down boot	cache flush low level data transfer

Budget Approach

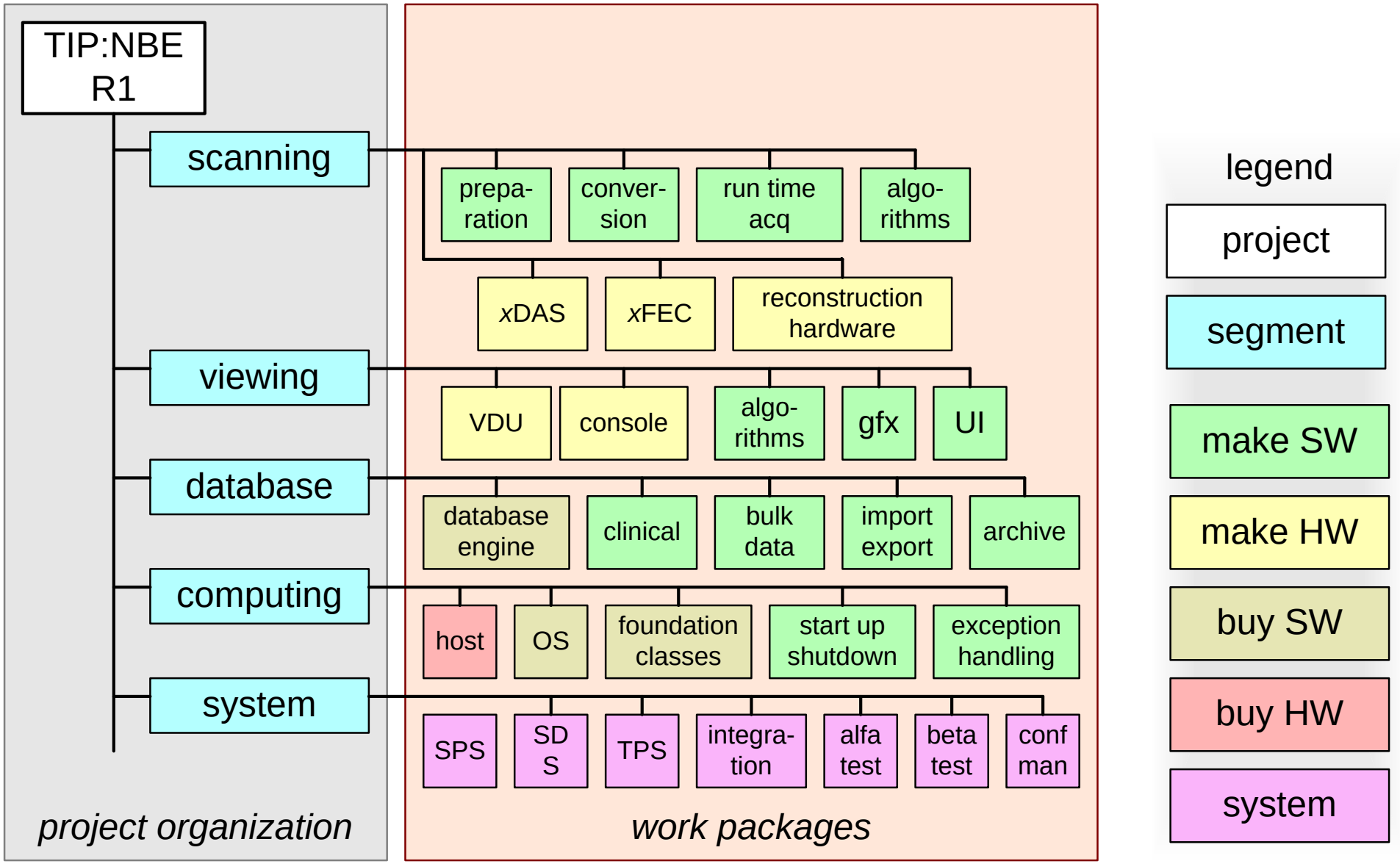
step	example
1A measure old systems	micro-benchmarks, aggregated functions, applications
1B model the performance starting with old systems	flow model and analytical model
1C determine requirements for new system	response time or throughput
2 make a design for the new system	explore design space, estimate and simulate
3 make a budget for the new system:	models provide the structure measurements and estimates provide initial numbers specification provides bottom line
4 measure prototypes and new system	micro-benchmarks, aggregated functions, applications profiles, traces
5 Iterate steps 1B to 4	

Safety, Reliability and Security Analysis

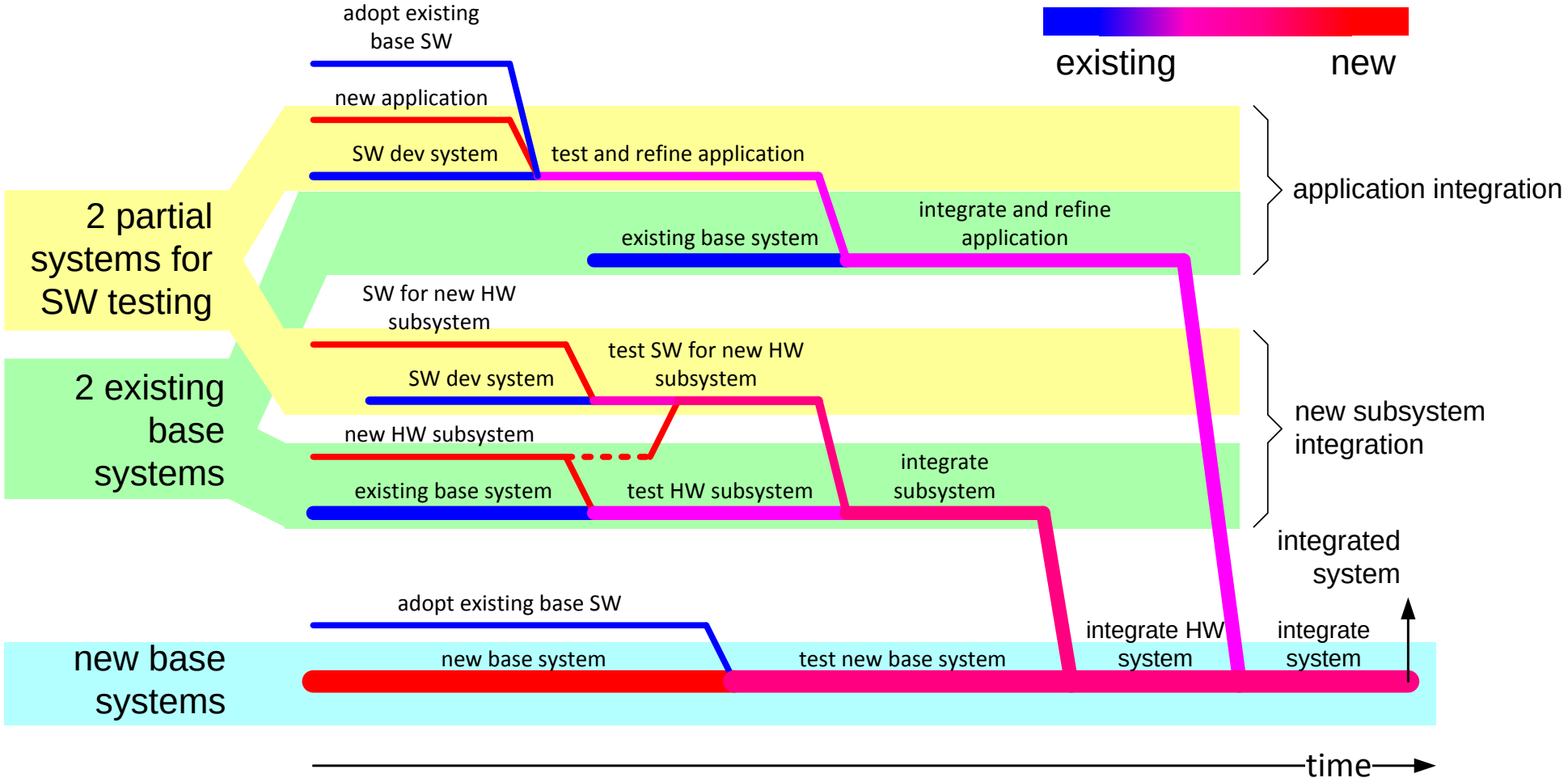


safety hazard analysis	potential hazards	probability severity	measures
reliability FMEA	failure modes	effects	measures
security	vulnerability risks	consequences	measures

Work Break Down



Integration Plan



Overview CR Submethods

Conceptual	**R**ealization
construction decomposition functional decomposition designing with multiple decompositions execution architecture internal interfaces performance start up shutdown integration plan work breakdown safety reliability security	budget benchmarking performance analysis value and cost safety analysis reliability analysis security analysis granularity determination