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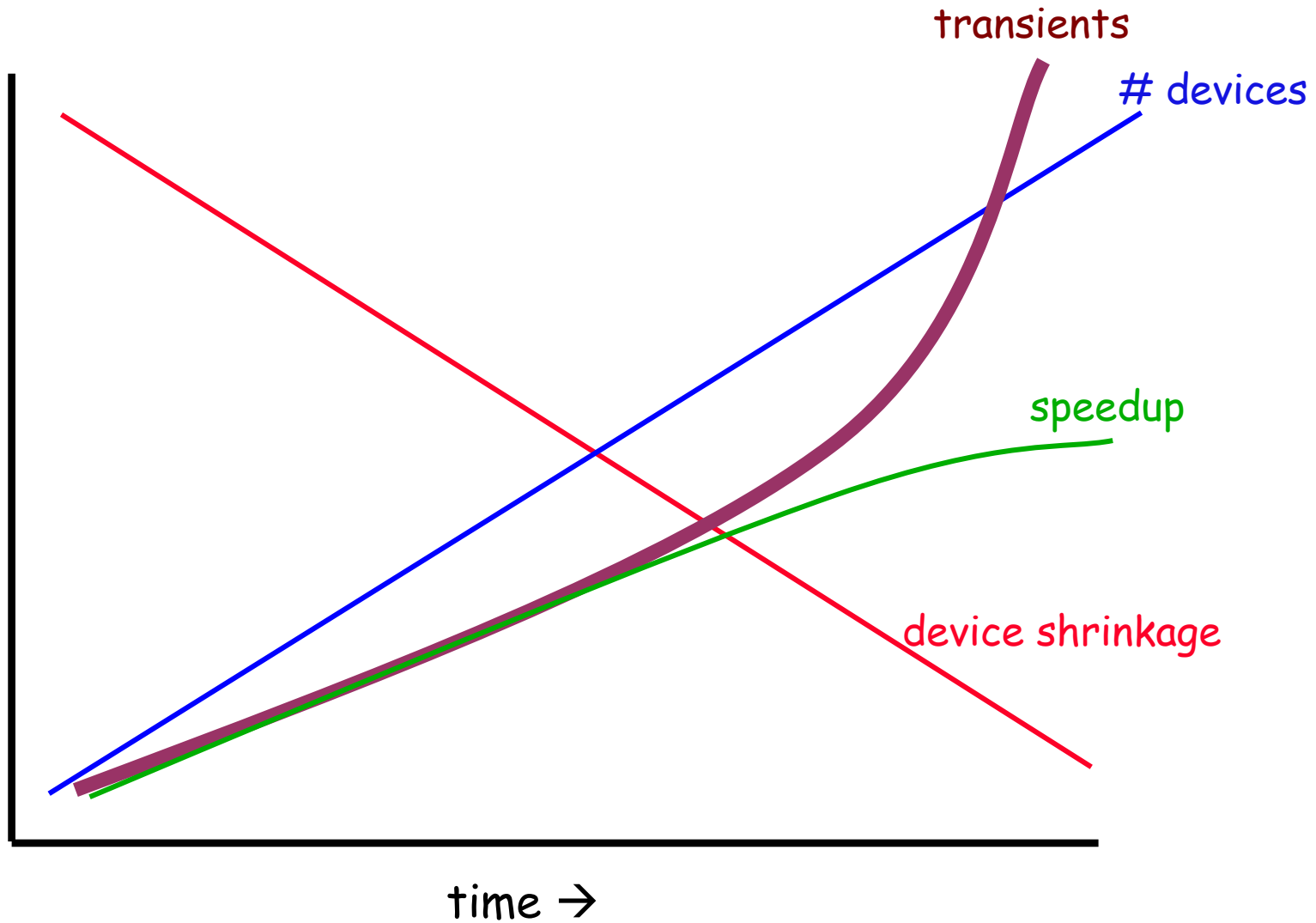
# Fighting Fire with Fire: Building **Dependable** Embedded Systems out of **Undependable** Components

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# (The Fun of Empirical Embedded System) Device Trends



# Coping with Transients

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- Efforts on HW-level
  - Design and fabrication
  - Redundant deployment
  - Etc.

needed.. but not sufficient:

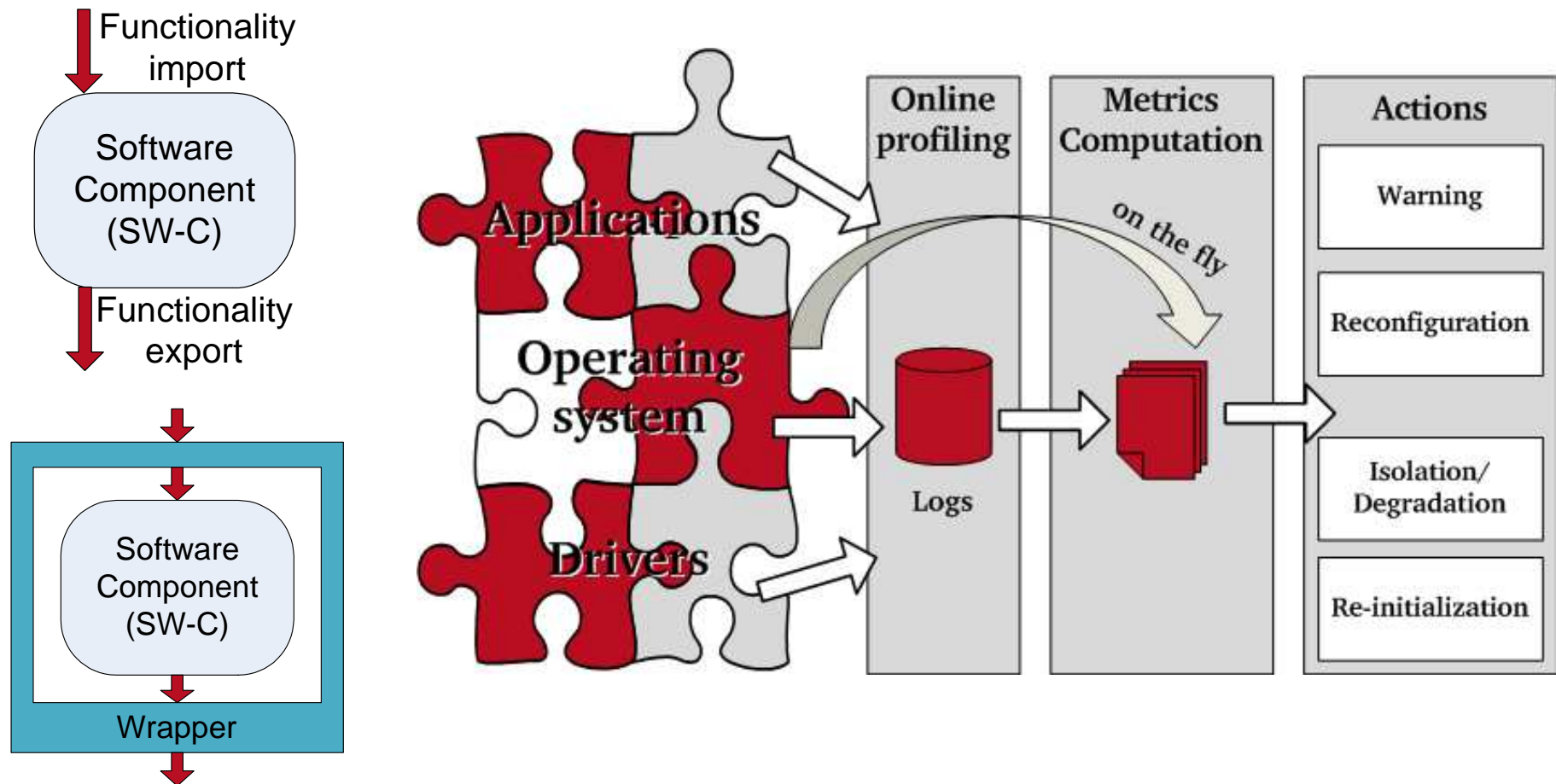
- Soft errors
- Aging
- Etc.

- Construct dependable embedded systems out of undependable HW components!
- SW efforts have lots of potentials too
- At **what SW level** of system abstraction should this be tackled?

# One SW Approach for Device Components

## Run-time profiling

- SW wrappers for component monitoring
- Isolation, re-initialization, reconfiguration etc.

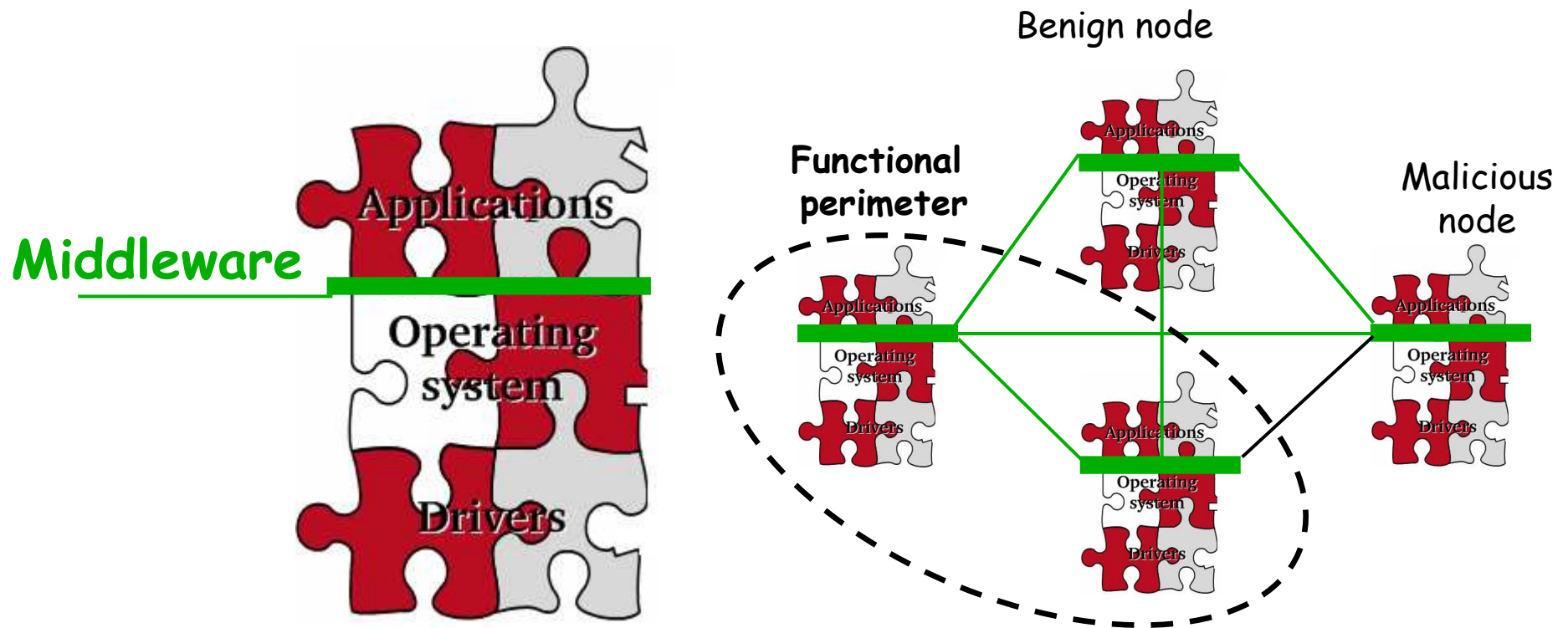


# Another SW Approach for Interconnected Devices

## Middleware solutions

E.g., run-time "perimeter diagnosis"

- Determine perimeter of disaster via diagnosis of functional (entity) perimeter
- Determine islands, groups ... of functional space and adaptive association/regrouping
- E.g., using group-membership protocols



# Summary

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- ❑ Transients are more & more frequent, the norm rather than an exception
  - Treat them as that!
  
- ❑ Complementarities of HW/SW dependability techniques: SW should cope with the “remaining” transients
  - Component wrappers on device component level
  - Middlewares on network level
  
- ❑ SW approaches support self-adaptation, self-healing etc.