An Era of Embedded Systems

Computing system type	Mainframe	Mini computer	Personal computer	Embedded system
Era	1950s on	1970s on	1980s on	2000s on
Form factor	Multi-cabinet	Multi-board	Single board	Single chip
Owner	Corporate	Department	Person	Anything
Users/system	1000s ~ 100s	100s ~ 10s	10s ~ 1s	1s ~ 1/10s
Cost	$1 Ms +	$100 Ks +	$10Ks – $1Ks +	$100s – $1s +
Total units	10Ks +	100Ks +	1 billions +	1 Trillions +

*The table is adapted from J. A. Fisher, P. Faraboschi & C. Young with extensions and modifications

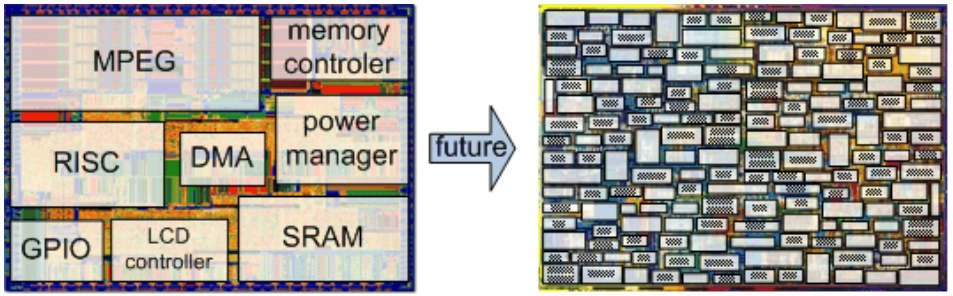
Embedded Systems are Ubiquitous

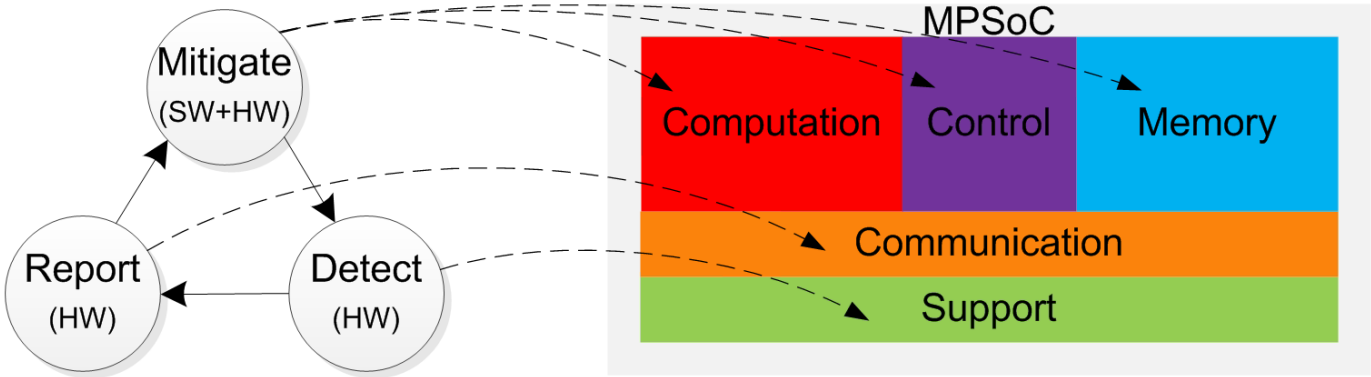
- Consumer electronics
  - Digital camera and camcorder
  - Cell phone
  - MP3 player
  - Wireless router
  - …
- In robots
  - Vision system
  - Arm and leg control system
  - …
- In telecommunications
  - Internet switch and router
  - Mobile phone base station
  - …
- In automobile
  - Engine control system
  - Anti-lock braking system
  - Navigation system
  - …
- In aircraft
  - Auto pilot system
  - …
- In watercraft
  - Radar system
  - …
- In satellite

…

Multiprocessor System-on-Chip

- Put all or most part of a complex system on a single chip
  - Enabled by shrinking feature sizes
  - Better performance, lower power consumption, and more compact and “reliable”
- Hybrid integration
  - Digital, RF, and mixed signal
  - SIP, 3D, *etc.*
- Network-on-chip





Thanks!