



Stafford and Districts
Amateur Radio Society

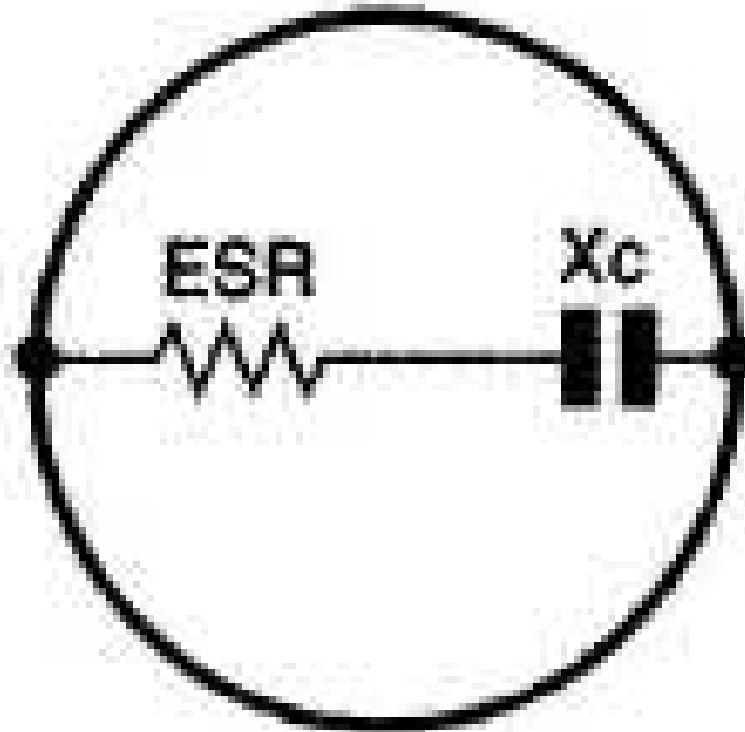
ESR

- ▶ Erythrocyte Sedimentation Rate

ESR

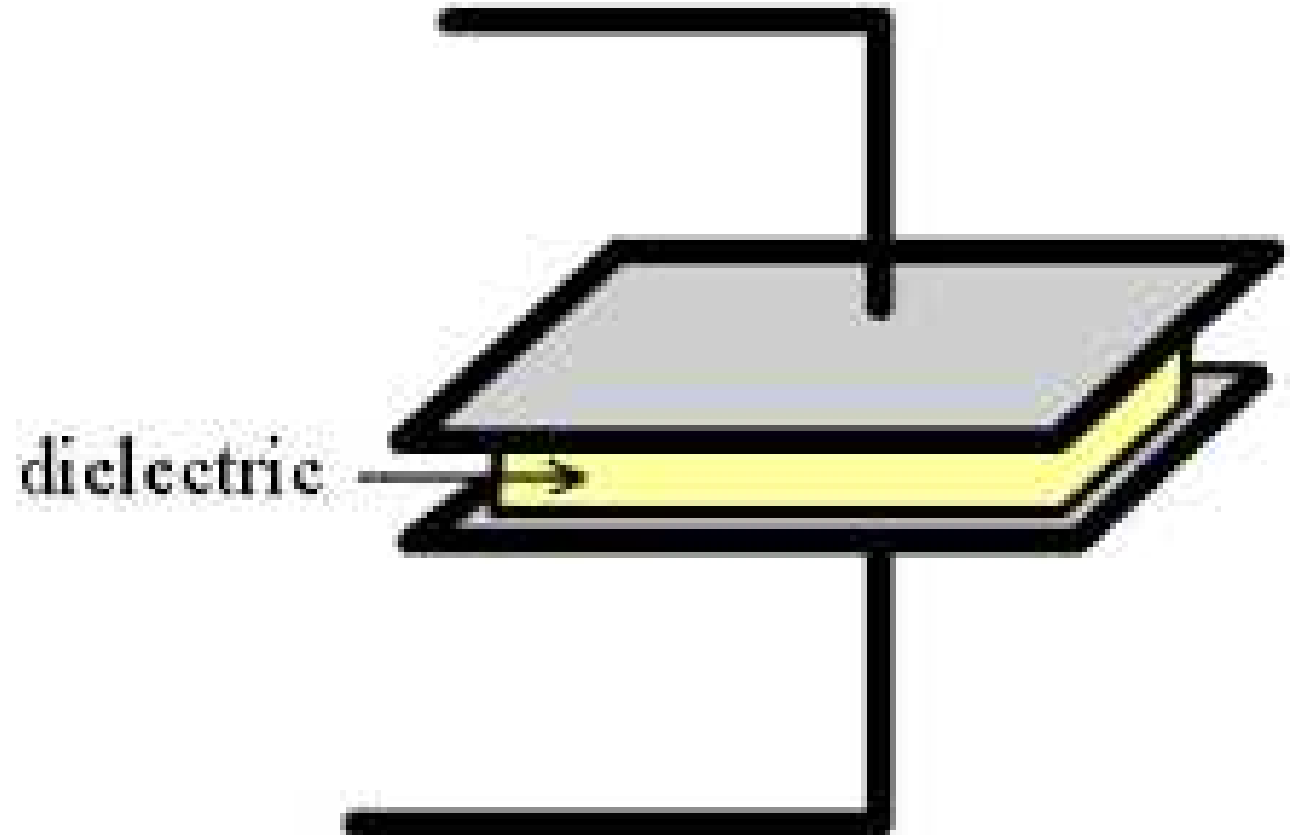
- ▶ Equivalent
- ▶ Series
- ▶ Resistance

Equivalent Series Resistance



A bit of theory-

- ▶ Capacitors
- ▶ Plates
- ▶ Dielectric



Dielectrics

- ▶ Air
 - ▶ Paper
 - ▶ Plastics
 - Mylar film
 - Polythene
 - Polystyrene
 - Polyester
 - Polycarbonate
 - Polypropylene
 - ▶ Mica
 - ▶ Ceramics
- 

Capacitors

- ▶ Non polarised
- ▶ Lower values
- ▶ Reliable
- ▶ May last forever



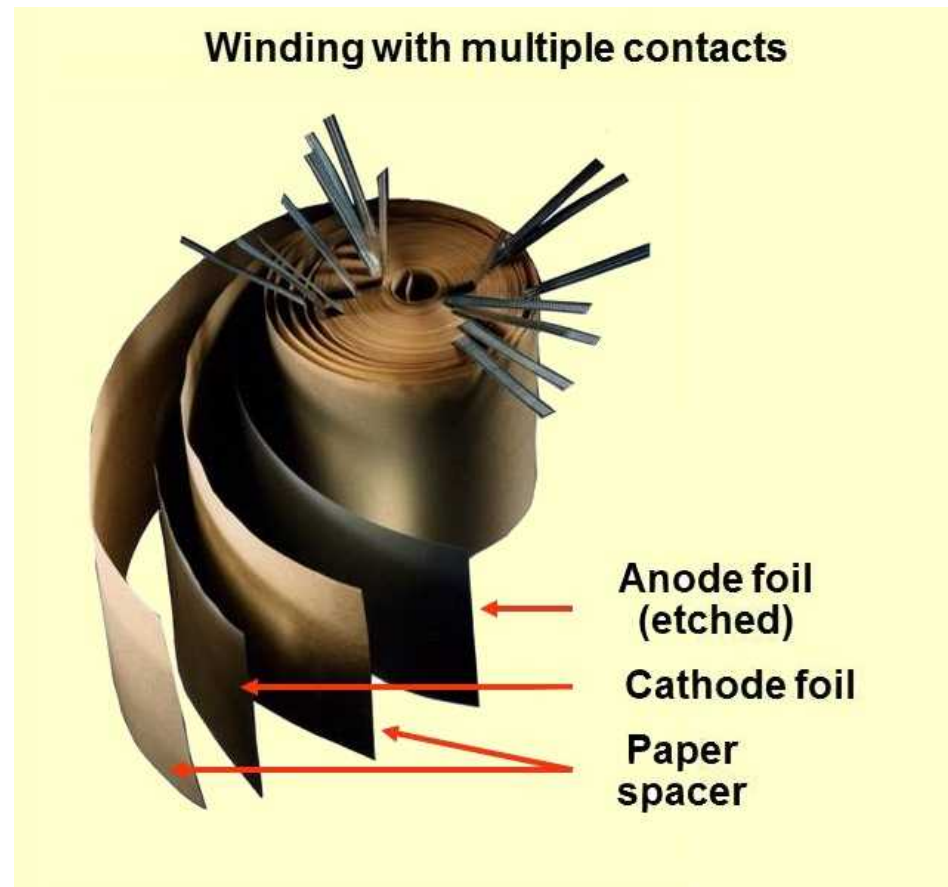
Capacitors

- ▶ Electrolytics
- ▶ Polarised



Aluminium Electrolytics

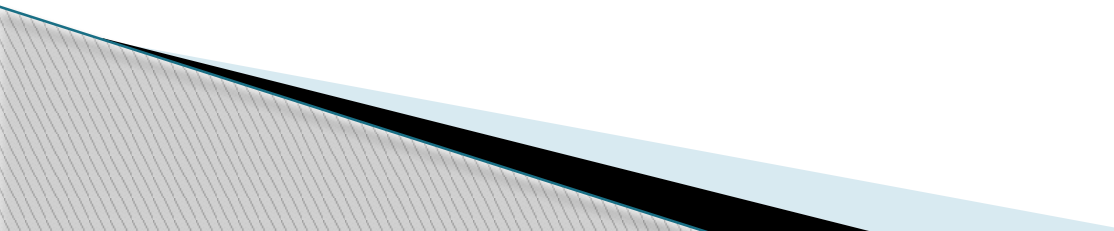
- ▶ Dielectric -Aluminium Oxide



Aluminium Electrolytic Capacitors

- ▶ Are UNRELIABLE !!
- ▶ Have a limited lifespan
 - Loss of oxygen in electrolyte- No self healing
 - Drying up of electrolyte
 - => INCREASED ESR

Who Cares?

- ▶ Circuit designers
 - ▶ Service technicians
 - ▶ You! When your equipment goes wrong
- 

Equipment Failure

- ▶ Think Power Supply
- ▶ Think Capacitor Failure

How to Recognise Failure

- ▶ Overheating



How to Recognise Failure

- ▶ Overheating



How to Recognise Failure

- ▶ Bulging



How to Recognise Failure

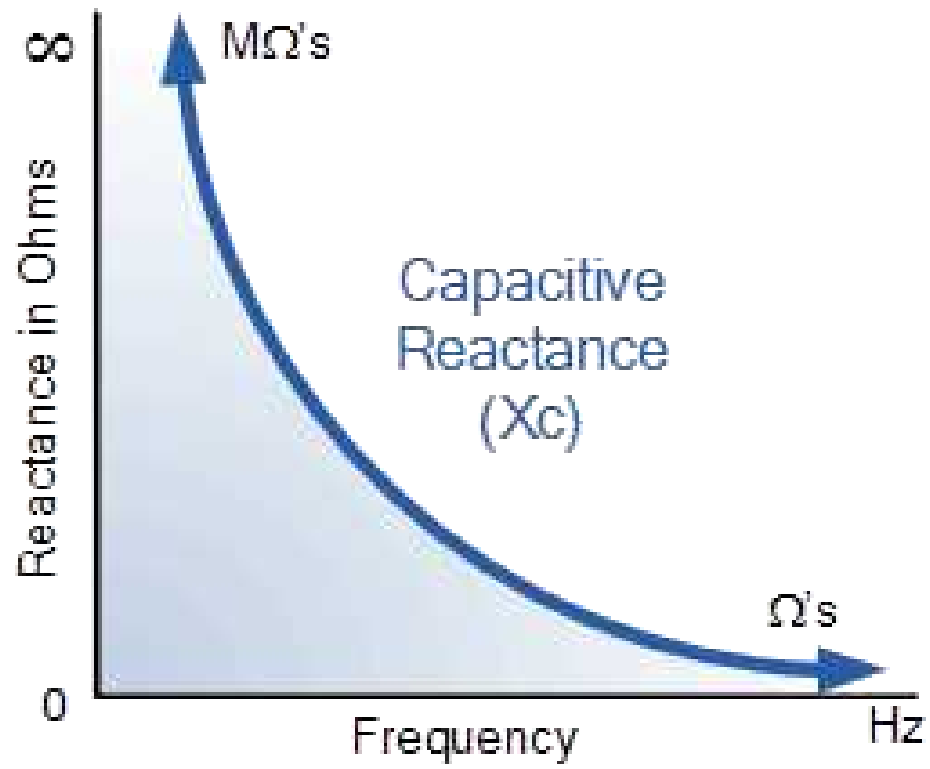
- ▶ Leaking



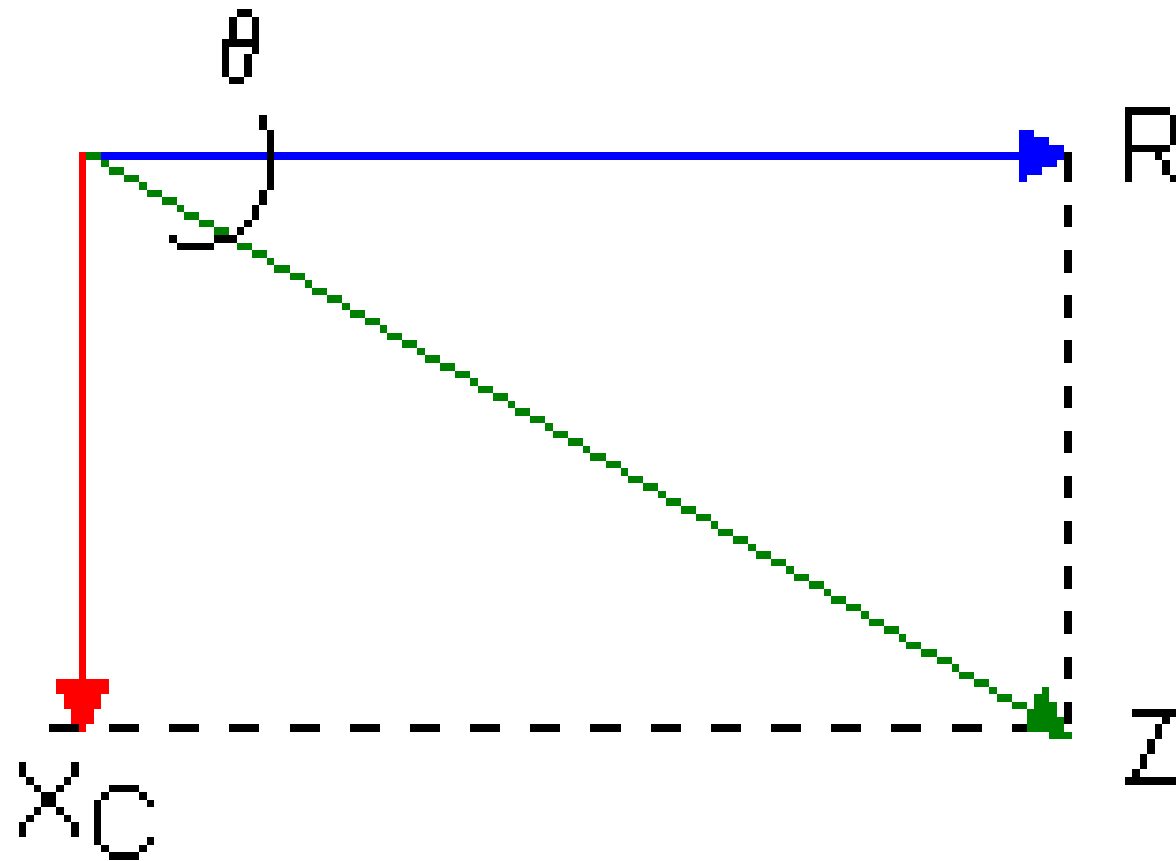
How to Recognise Failure



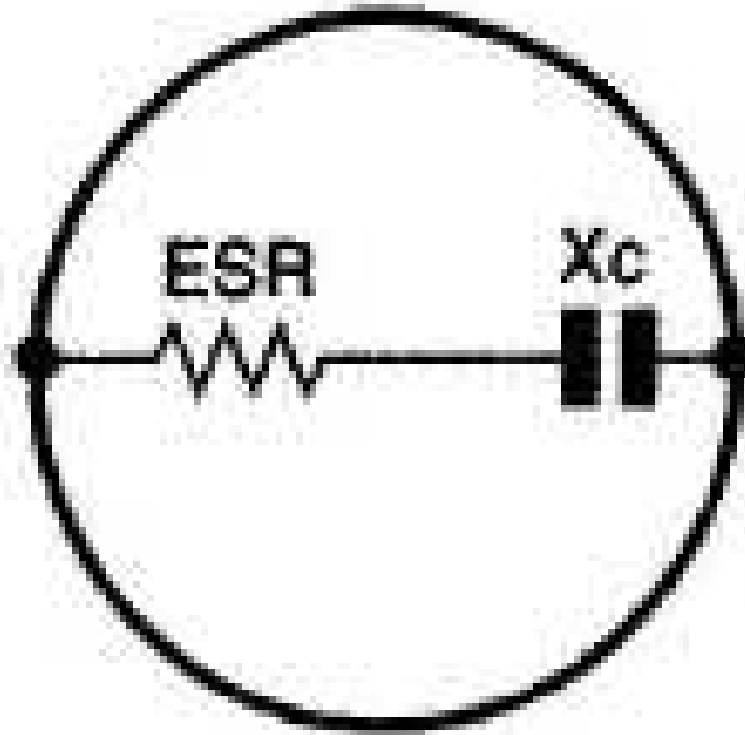
$$X_C = \frac{1}{2\pi fC}$$



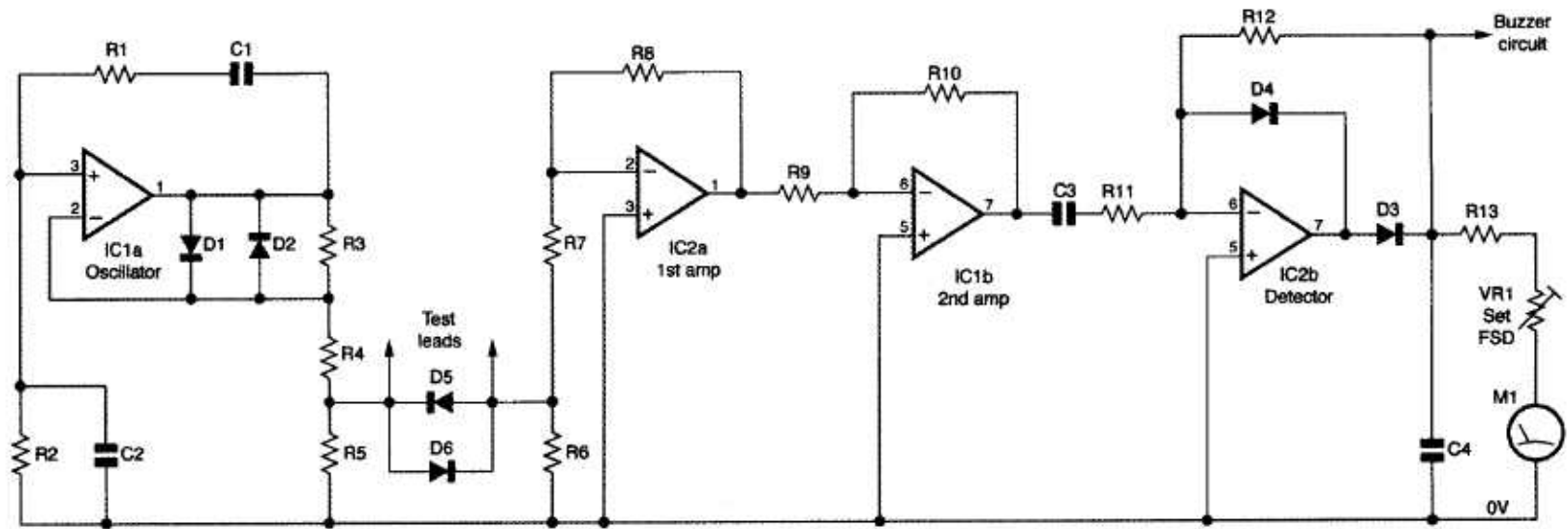
Impedance



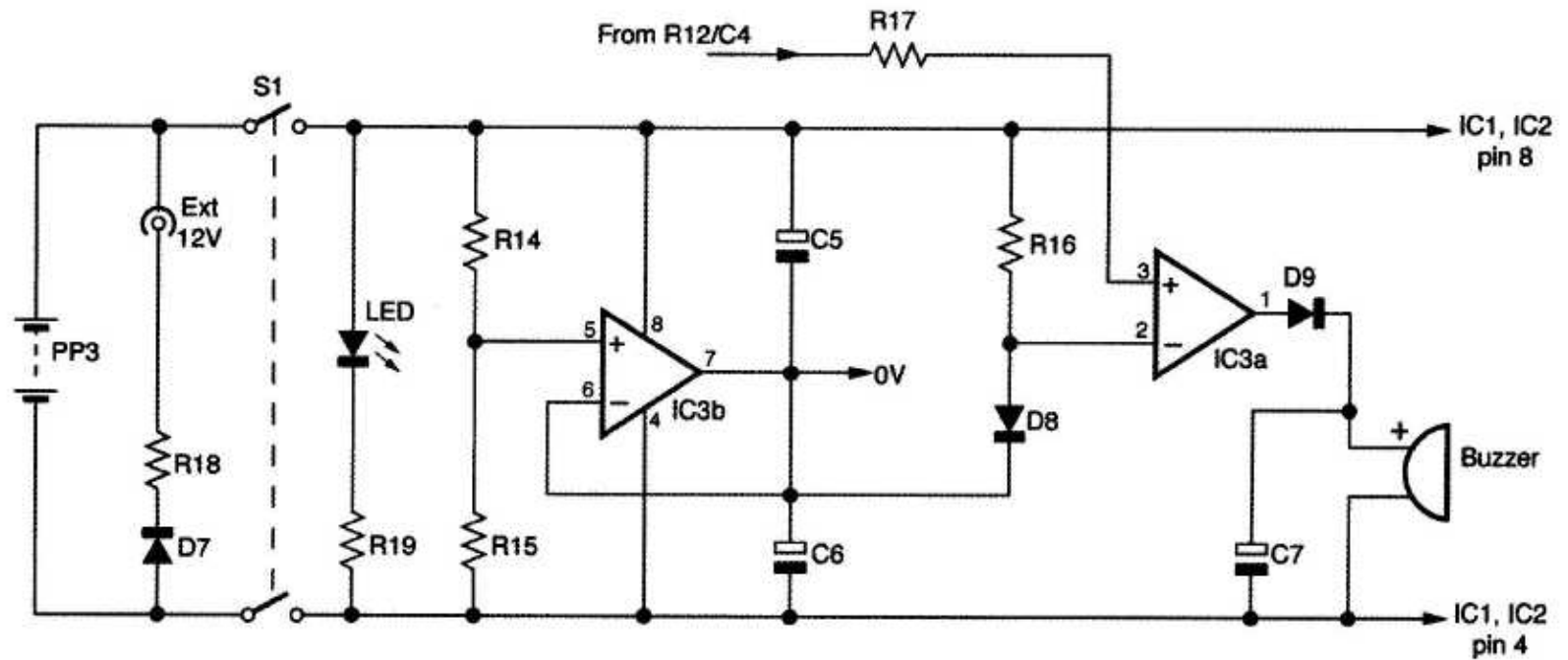
Equivalent Series Resistance



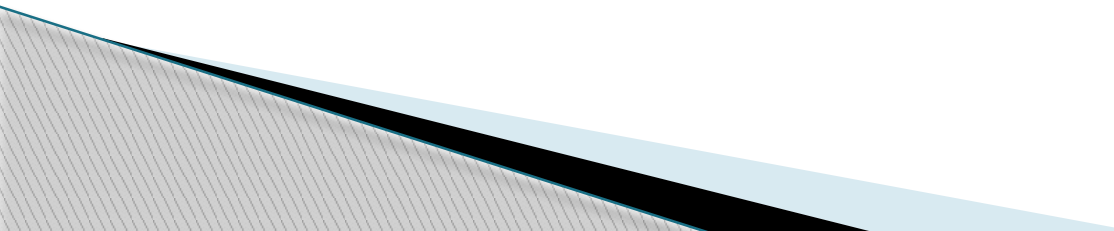
The ESR Meter



The ESR Meter



The ESR Meter

- ▶ Sorts good from bad capacitors
 - ▶ No need to remove capacitor from PCB
 - ▶ Low reading ohmmeter
 - ▶ Cheap
 - ▶ Easy to build
 - ▶ How did I manage without it?
- 



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