

Where Next?

Some Musing on the Future of Software Architecture

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Lots has been achieved

- 20+ years has seen great advancements in software architecture:
 - Methods
 - Processes
 - Design tools/modeling
 - Frameworks
 - Best practices/patterns
 - Standards



But are we running out of steam?

- Many incremental improvements over last 5 years
- Any really exciting innovations in our field:
 - In research?
 - In practice?
- Are these addressing the growing complexity and scale of systems?
 - Hmmm...



Becoming Quantitative ...

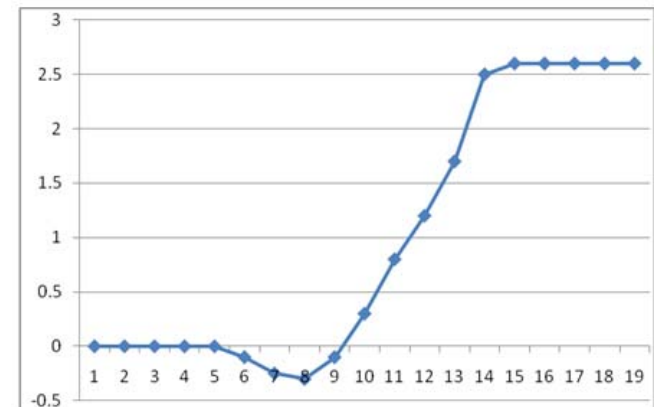
- Qualitative = 'touchy feely'
- Need quantitative methods/tools for architecture analysis and design, e.g.
 - Assessing design alternatives
 - Buy versus Build
 - Cost/effort estimate predictions from architecture models
 - Performance/scalability predictions from architecture models
- Many numerical methods exist that could be exploited:
 - Uncertainty quantification
 - Sensitivity analysis
 - Decision theory (e.g. AHP)
 - Regression
 - Error analysis



But isn't Quantification hard?

- Yup - but it doesn't stop others ...
- Climate models
 - Simulations typically 'calibrated' to produce outputs that match reality (ie historical data)
 - They 'adjust' for 'bias' in models
 - Much still unknown about the physics/chemistry of climate at a global scale
- We need concerted R&D to move software architecture to more quantitative foundations
 - Models
 - Methods
 - Tools

```
;
; Apply a VERY ARTIFICIAL correction for decline!!
;
yrloc=[1400,findgen(19)*5.+1904]
valadj=[0.,0.,0.,0.,0.,-0.1,-0.25,-0.3,0.,-0.1,0.3,0.8,1.2,1.7,2.5,2.6,2.6,
2.6,2.6,2.6]*0.75 ; fudge factor
if n_elements(yrloc) ne n_elements(valadj) then message,'Oooops!'
yearlyadj=interpol(valadj,yrloc,timey)
```



And we need to Study Scale (Ultra Large Systems)

- Size of systems is growing rapidly, e.g:
 - Smart grid
 - Internet-scale applications
 - Scientific data repositories
 - Internet of Things/Sensor networks
- Scaling stresses everything
 - Design, Development
 - Deployment, Evolution
- Building Internet Scale systems remains very much a 'black art'
 - Something the software architecture community is well positioned to address?
 - Approaches must combine both design and technology, reaching down the various technology stacks
 - <http://highscalability.com/> is a great read



“Twitter alone generates more than 7 terabytes of data every day, Facebook 10 TB...”

Summary ...

