

Some Possible Futures of Computing



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Who Am I?

- Early innovator in firewall market
- Early innovator in VPN market
- Early innovator in IDS market
- Currently researching system log analysis/aggregation and event management

What?

- What is this talk about and why?
 - We have been cheerfully assuming things can continue to go along the same path they have been going
 - Bugs, complexity, CPU speed, etc
 - But... **Can** they?

A Word of Warning

- All statistics in this talk are *made up*
 - I.e.: *Entirely* fictitious
- All cool charts are completely *fake*

...But they might be accurate

The History of Computing

Planetary Time

Humans

Technology

Computers

Sorry, they don't
make pixels that
small

The History of Computing

- What's the point?
 - We've been doing this for such a short time there's no reason not to believe that we won't have some cataclysmic technological reversal or reinvention
 - Horses -> steam
 - Steam -> internal combustion
 - Internal combustion -> hybrid electrical
- Let's ***not*** get ***comfortable!***

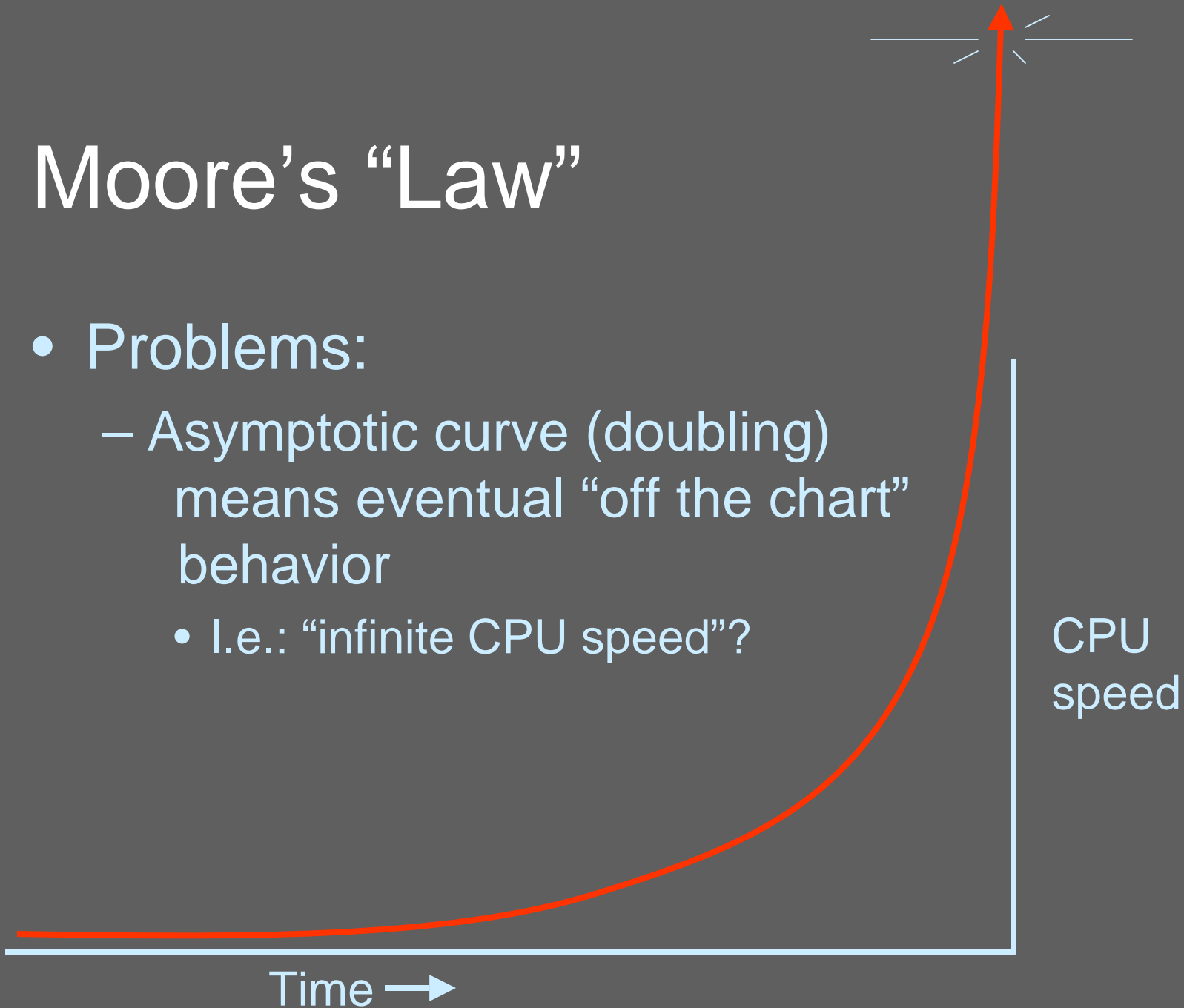
Moore's "Law"

- We've all seen this one:



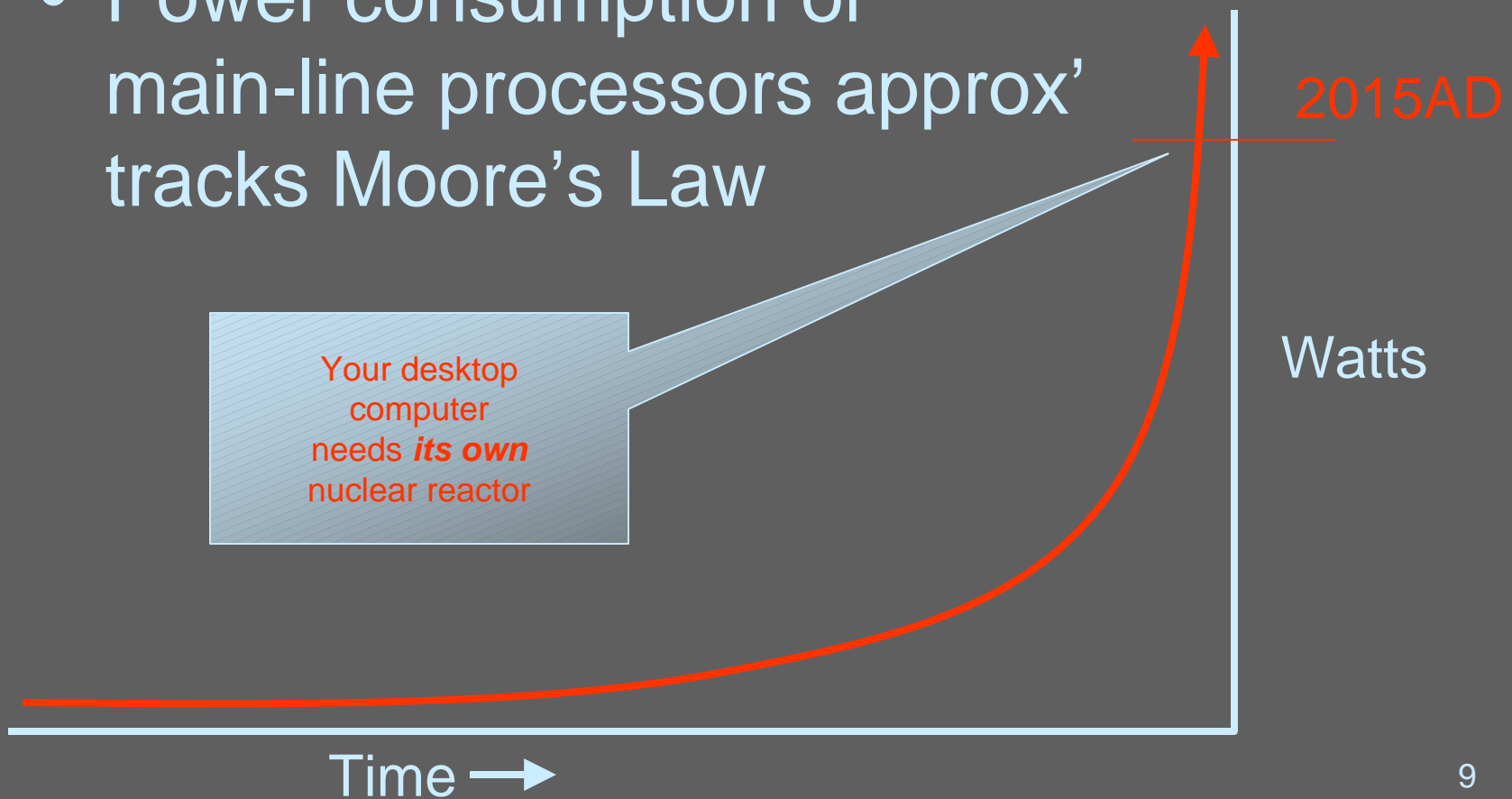
Moore's "Law"

- Problems:
 - Asymptotic curve (doubling) means eventual "off the chart" behavior
 - I.e.: "infinite CPU speed"?



Moore & Electricity

- Power consumption of main-line processors approx' tracks Moore's Law



Moore & Temperature

- Have you looked at the cooling on your PC lately?



2020AD

Fortunately, we won't get here (because of energy consumption) since this is the surface temperature of the sun

Degrees F.

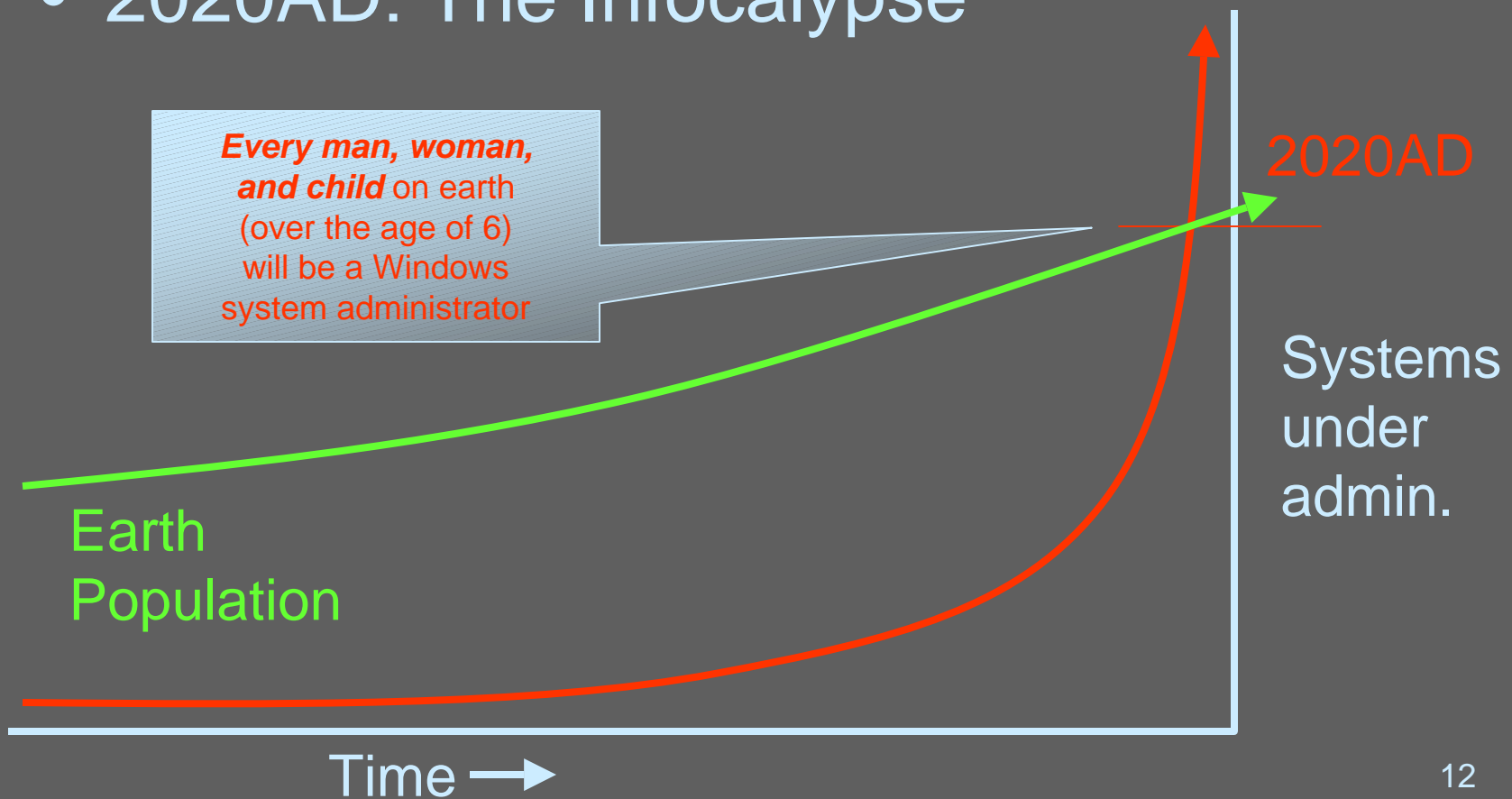
Time →

Windows Sys Administration

- Estimated time to re-install WinXP by inexperienced user: 4 hours
 - If it's not secured, likelihood a re-install will be required with 1 year: 50%
- Estimated time to secure WinXP by experienced security admin: 1 hour
 - If it's secured, likelihood a re-install will be required within 1 year: 50%

Windows Sys Administration

- 2020AD: The Infocalypse



Windows Sys Administration

- The Infocalypse: *take 2*
 - By 2030, 80% of human effort on planet earth will be Windows System Administration
 - The rest will be working in Redmond writing patches and bug-fixes
 - 2 guys in Kansas will be left to grow all the food for the planet

Windows Sys Administration

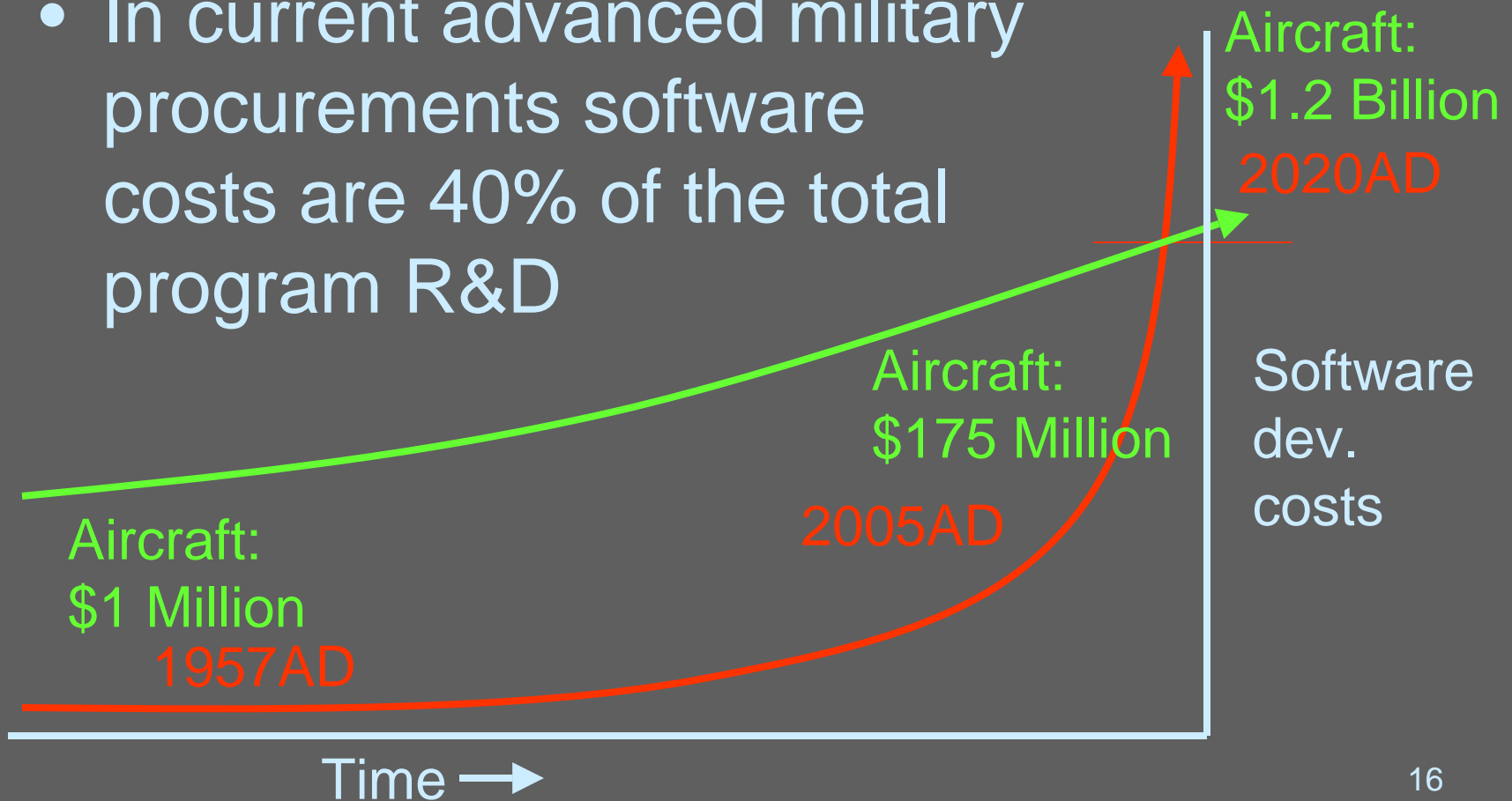
- The Infocalypse: *take 3*
 - 2035AD:
 - “Anno Domini” assumes a new meaning:
 - “Active Directory”

Windows Sys Administration

- System administration is a Hard Problem
 - Really: it's about coping with complexity

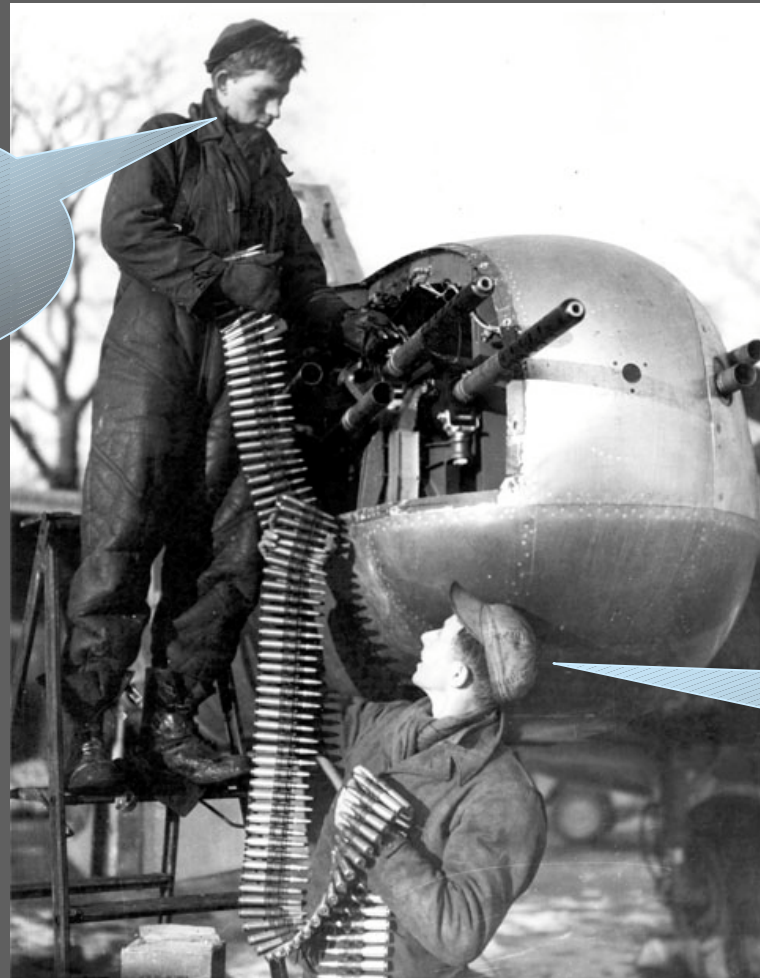
Software Engineering

- In current advanced military procurements software costs are 40% of the total program R&D



Software Engineering

P-38 Lightning:
\$138,284 apiece



Lines of
Code:
0

*Lots of
.50 cal ammo:
priceless!*

Software Engineering

F-18A:
\$59,000,000 apiece

Does this thing
also play MP3s?

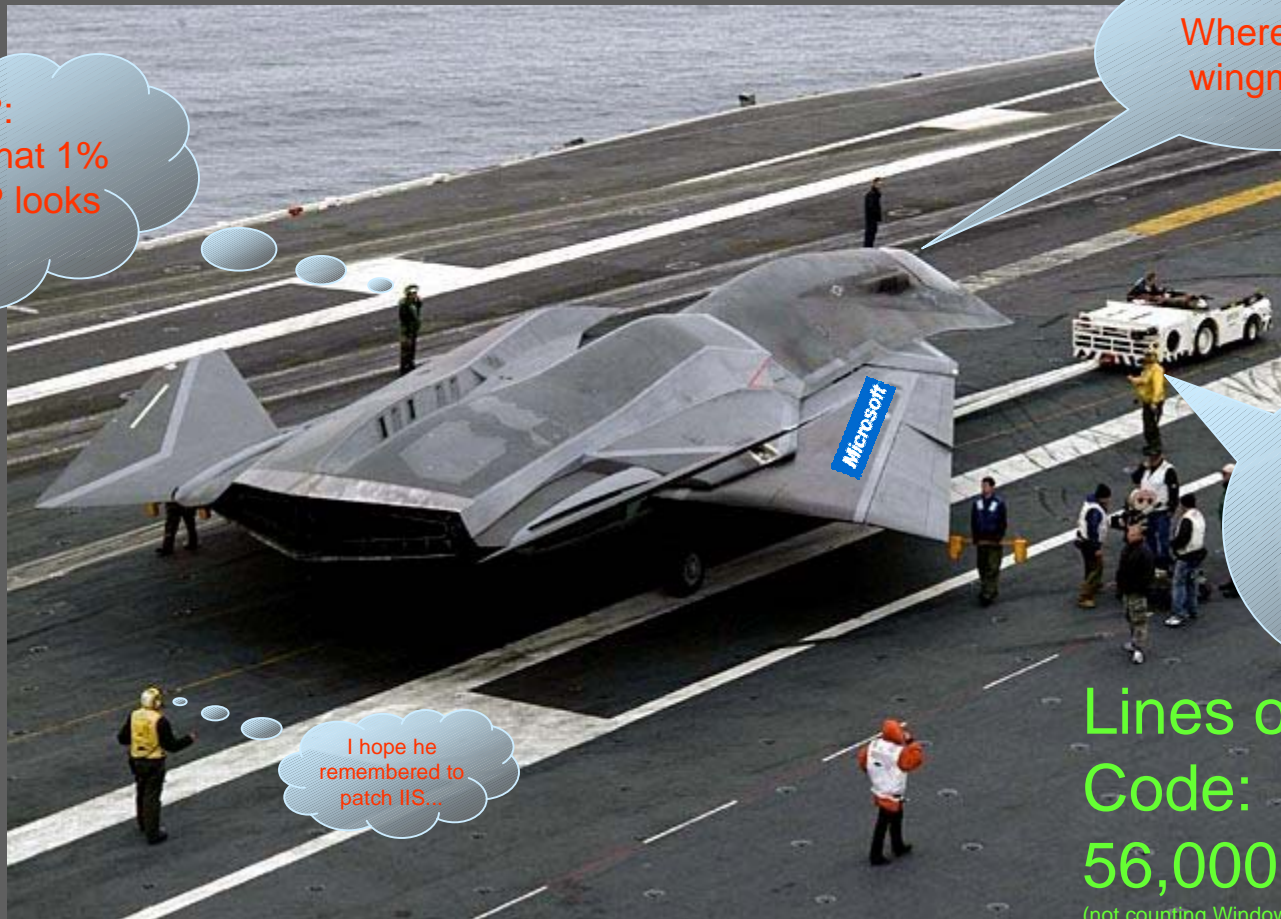


Dude, you're
getting a
(bigger) Dell!

1986 (first flight)
Lines of
Code:
1,000,000+

2004 (gulf war)
Lines of
Code:
8,300,000+

Software Engineering



F-???:
So that's what 1%
of the GNP looks
like!

Where's my
wingman!?

Dude,
you're *it!*
You're all
we can
afford!!

I hope he
remembered to
patch IIS...

Lines of
Code:
56,000,000+
(not counting Windows CE)

Code Bloat

- Microsoft used to brag about how many lines of code went into Windows
 - ...Now they are silent
 - Because **nobody knows**
 - Is a 3rd party device driver written by a Pakistani consultant for a Taiwanese company resold by a US dot-com a part of Windows or not?

(Of **course** it is; it runs in kernel address space!!)

Code Bloat

- More simple example:
 - Sendmail used to be considered “**dangerously large** software” and was shunned by many security practitioners (including me)
 - 17362 lines: sendmail 4.6 (1991) from net2 tape
 - 299545 lines: postfix-2.2.2 (current release)
 - 220263 lines: sendmail-8.13.4 (current release)

The “small” alternative mailer is now **bigger!**

Complexity

- Today:
 - It is literally impossible to tell what code you are running
 - DLLs call DLLs
 - Interpreters are everywhere
 - Plug-ins call .NET remote procedure calls
 - Forget understanding code

Complexity

The active widget calls
foo342.dll which links in
the C library as it's called
by the Java runtime...
I know. I'll just
shoot myself.



Complexity

No, wait.
I'll just get it to compile,
ship it as **beta**, and let our
customers find
if it works!



Complexity implies Bugs

- I don't need to harp on this



Bugs Impact Security

- I don't need to harp on this, either

Bugs Impact Security *(redux)*

- Our usual reaction to security problems:
Add something new
 - Bad network code: add firewall
 - Bad firewall diagnostics: add IDS
 - Bad execution permissions: add antivirus
 - Bad process model: add antispyware***... more complexity!***

The Quest for “Plan B”

- It's an open question, to me, if we'll ever get our heads out of the sand and look for an alternative

Coping with Complexity

- 3 Obvious Options
 - Add layers of complexity management
 - Build Better Humans
 - Build Simpler Stuff

Complexity Management

- Develop tools that manage complexity for us
 - Then hope they work!
 - Because - how do you verify that they work correctly without managing the complexity yourself?
 - Cases where this works: CAD, Chip design
 - Cases where this fails: Network management, Software development

Complexity Management (more)

- In fact, it appears that complexity management tools work well only in problems that are fairly closely bounded
 - Like chip design
 - Unlike system administration
 - Because system administration is the art of massive individuality
- My Guess: ***Not likely***

Build Better Humans

- The “video game generation” may be followed by the “millions of lines of code generation”
 - It’s possible we’ll adapt rapidly enough to keep up
 - Maybe we’ll develop a “windows system administration” center in our brains?
- My guess: **I think we’re not keeping up**

Build Simpler Stuff

- Remove device customization and you can build simpler devices and code for them
 - This is the basis of the “appliance”
 - If PCs for example, had 1) hard drive interface (instead of IDE, SATA, SCSI, etc) 1) video interface and 1) network interface we could reduce kernel code size of Linux by 30%

Build Simpler Stuff (more)

- If PCs were simple, they'd be Sony Playstation-2s

When Moore's "Law" Fails

- KleenKode™ concept
 - Instead of relying on faster processors to carry more dumb code:
 - ***Run smarter code on existing processors!***
 - KleenKode for Microsoft Office:
 - Microsoft Word with 90% of the features removed
 - 16Mb executable becomes 120K
 - 20Mb core image becomes 2Mb

Push toward Appliances

- The death of general-purpose computing
- The advent of disposable software systems

The Future (my view)

- Zero sysadmin systems == disposable systems
- KleenKode == low-energy low-cost systems
- Death of general purpose computing == end of Windows except as legacy server platform

The Future (my view)

- Software Sales Model Overturn == “buying” software makes no sense in an environment where platforms are disposable
 - Switch to per-service subscription model
 - Cell phones, PDAs, etc, are examples of this

The Future (my view)

- What happens to Security?
 - Security now becomes a problem where systems bump up against each other and exchange data
 - Security compromise? Reset it or throw it away
 - Viz: Paris Hilton's cellphone
 - Servers become highly specialized (high cost high value points of attack)

Summary

- I don't think we're doomed
...but I think we're in **trouble**
- Computing is still very much in its infancy
 - Plenty of time to re-assess and re-design our approach to it
 - Besides we'll have no choice