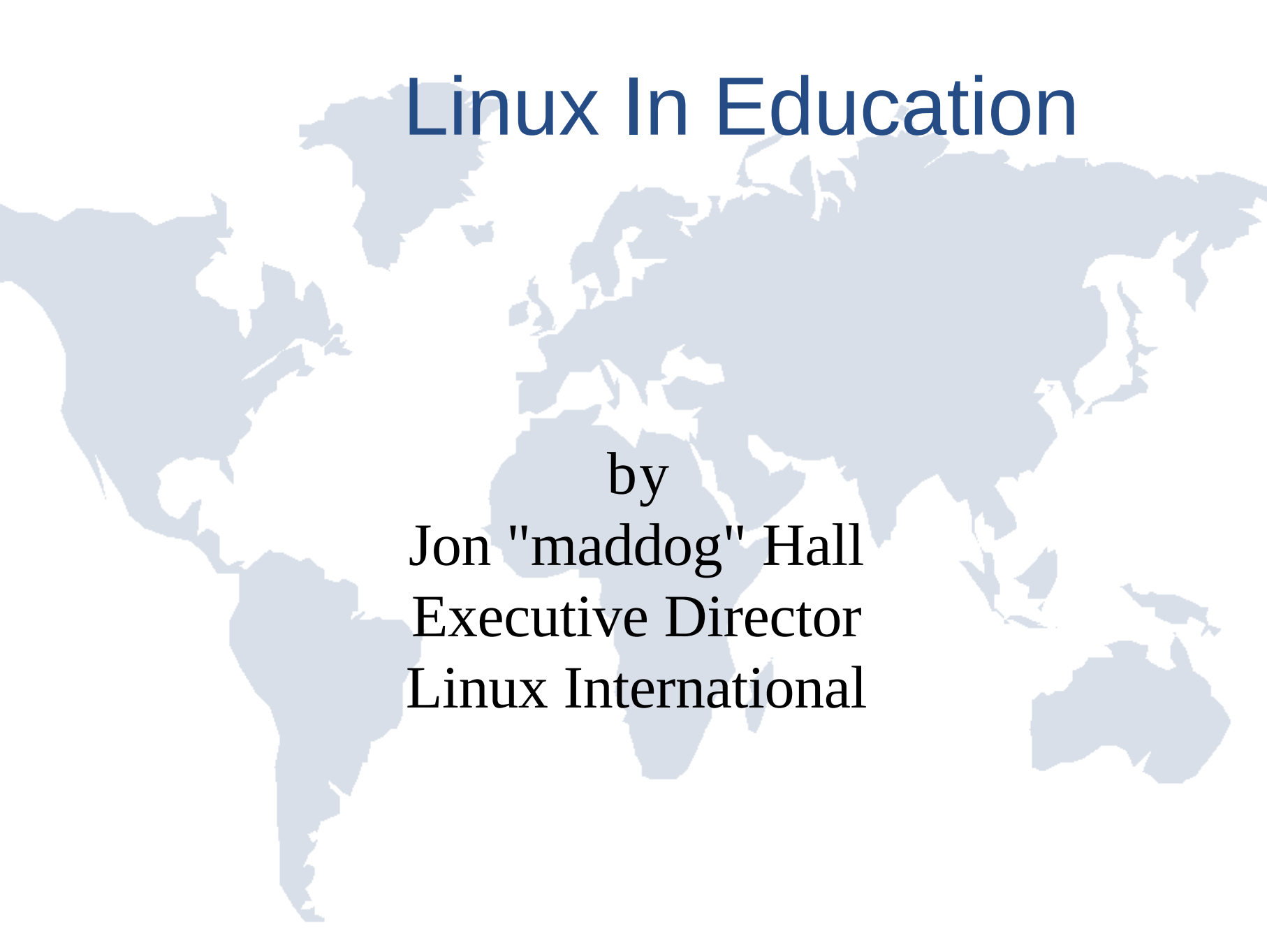




Linux In Education

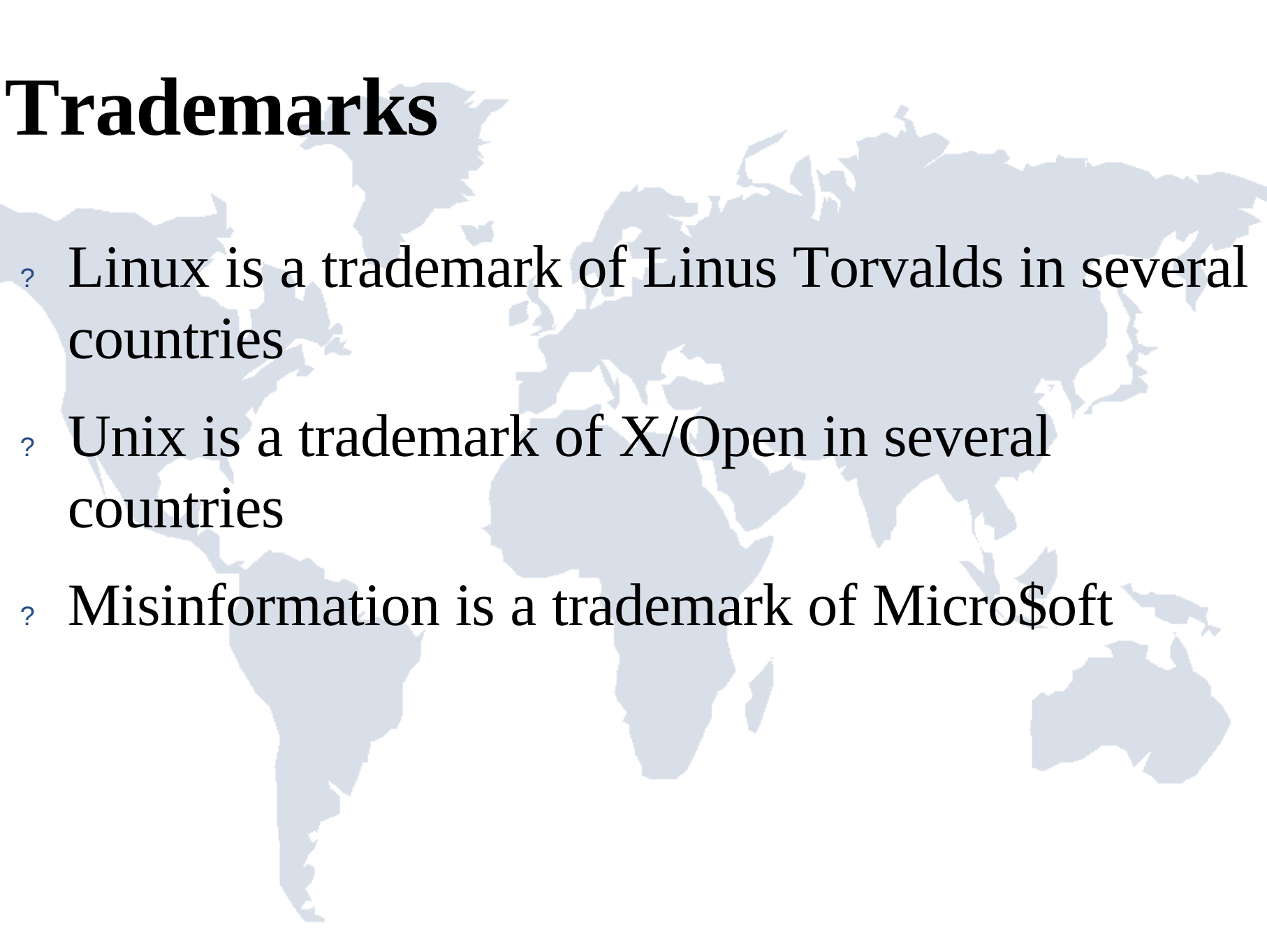
by

Jon "maddog" Hall

Executive Director

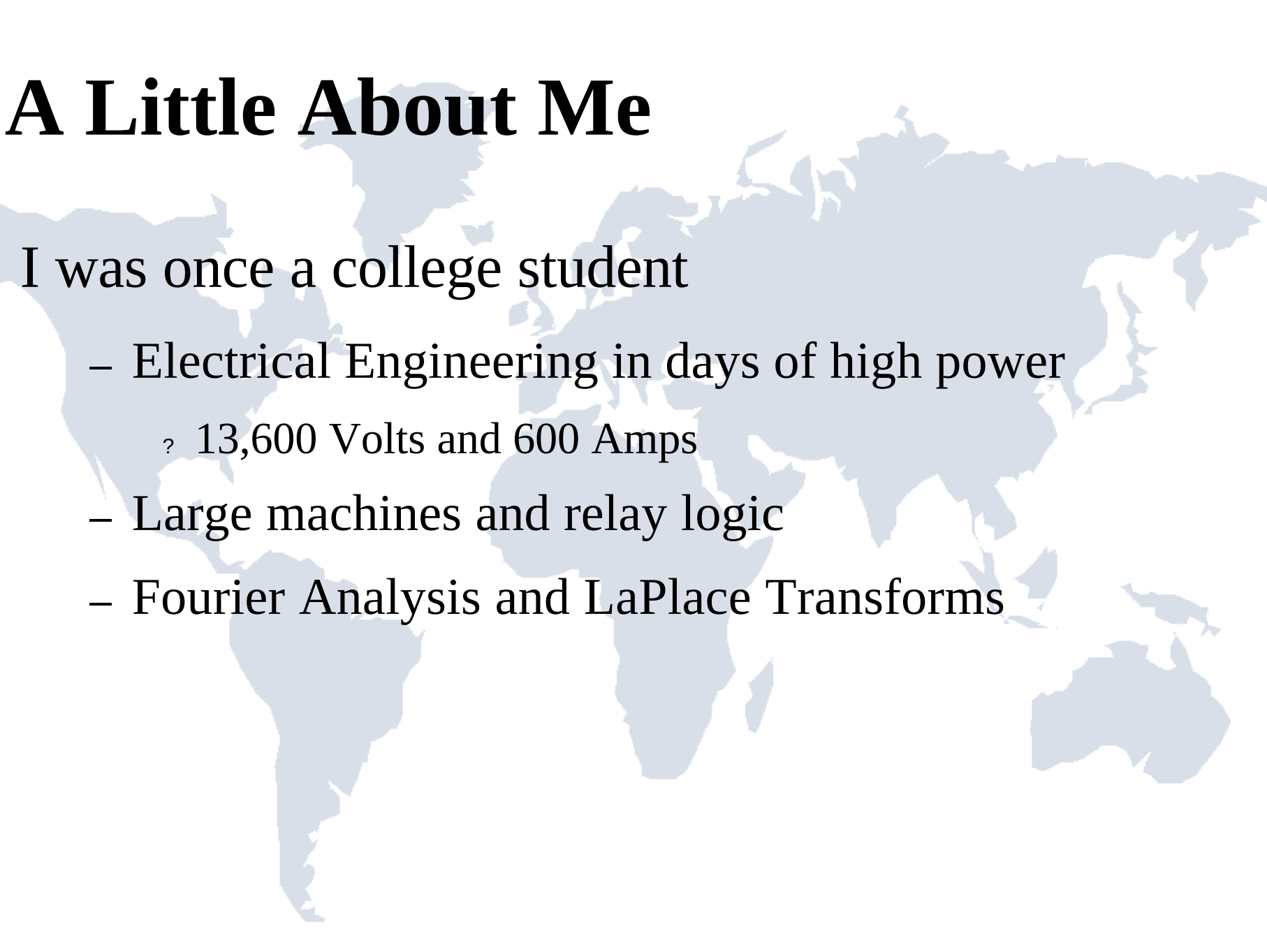
Linux International

Trademarks



- ? Linux is a trademark of Linus Torvalds in several countries
- ? Unix is a trademark of X/Open in several countries
- ? Misinformation is a trademark of Micro\$oft

A Little About Me



I was once a college student

- Electrical Engineering in days of high power
 - 13,600 Volts and 600 Amps
- Large machines and relay logic
- Fourier Analysis and LaPlace Transforms

Co-op Student

Western Electric, part of
the Bell System

A correspondence
Course

- How to program the IBM
1130 in FORTRAN

Plenty of “networking”

2 volts and a milliamp – *do it to me*



Our Computer Club

- ? Two Digital PDP-8s
 - 4K of 12-bit words
 - ASR-33 Teletype – 5 cps
 - ? Paper Tape Reader
 - ? Paper Tape Punch
 - Front panel with toggle switches and lights
- ? Operating System?



....And a Link-8

- ? Like a PDP-8
 - A/D converters
 - D/A converters
 - 4” CRT
 - *High Speed* optical paper tape reader
 - Link Tape
- ? A kind “DEC Guy”
 - Books



...and DECUS

- ? A library of programs contributed by users
 - 5 POB* for a text editor
 - 15 POB* for an assembler

*One PitcherOfBeer=One USD

Li[vb]re and Gratis

- ? Free as in Freedom....not as in beer!
 - Freedom to look at the source code
 - Freedom to change the source code
 - Freedom to redistribute the changes
- ? You are not free to restrict someone else's freedoms
- ? You can charge for your services

Recover investment in POB, and get more POB

Open Source is Not New

- ? Originally most code was “Open Source”
 - Conferences shared source code
 - Researchers published source code
- ? DECUS in 1969 published source code
- ? Manufactured software changed this
 - Booing stopped eventually

Linux In Education

? Duties of a University

- Educate future leaders

 - ? Government

 - ? Industry

- Advance knowledge

? Open Source is perfect for this

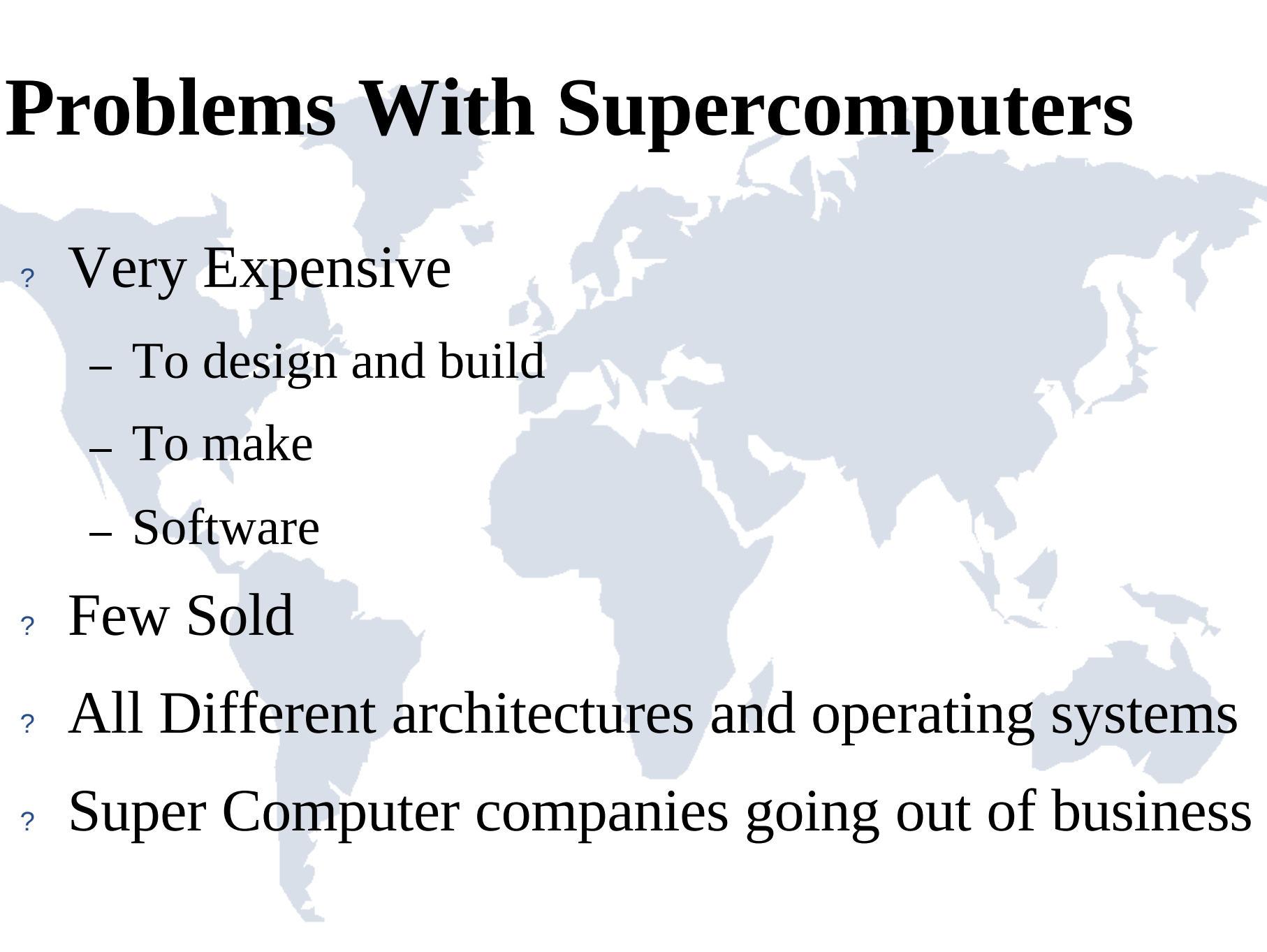
- *Lower costs*

- *Easier to exchange research and data*

- *Understanding not training*

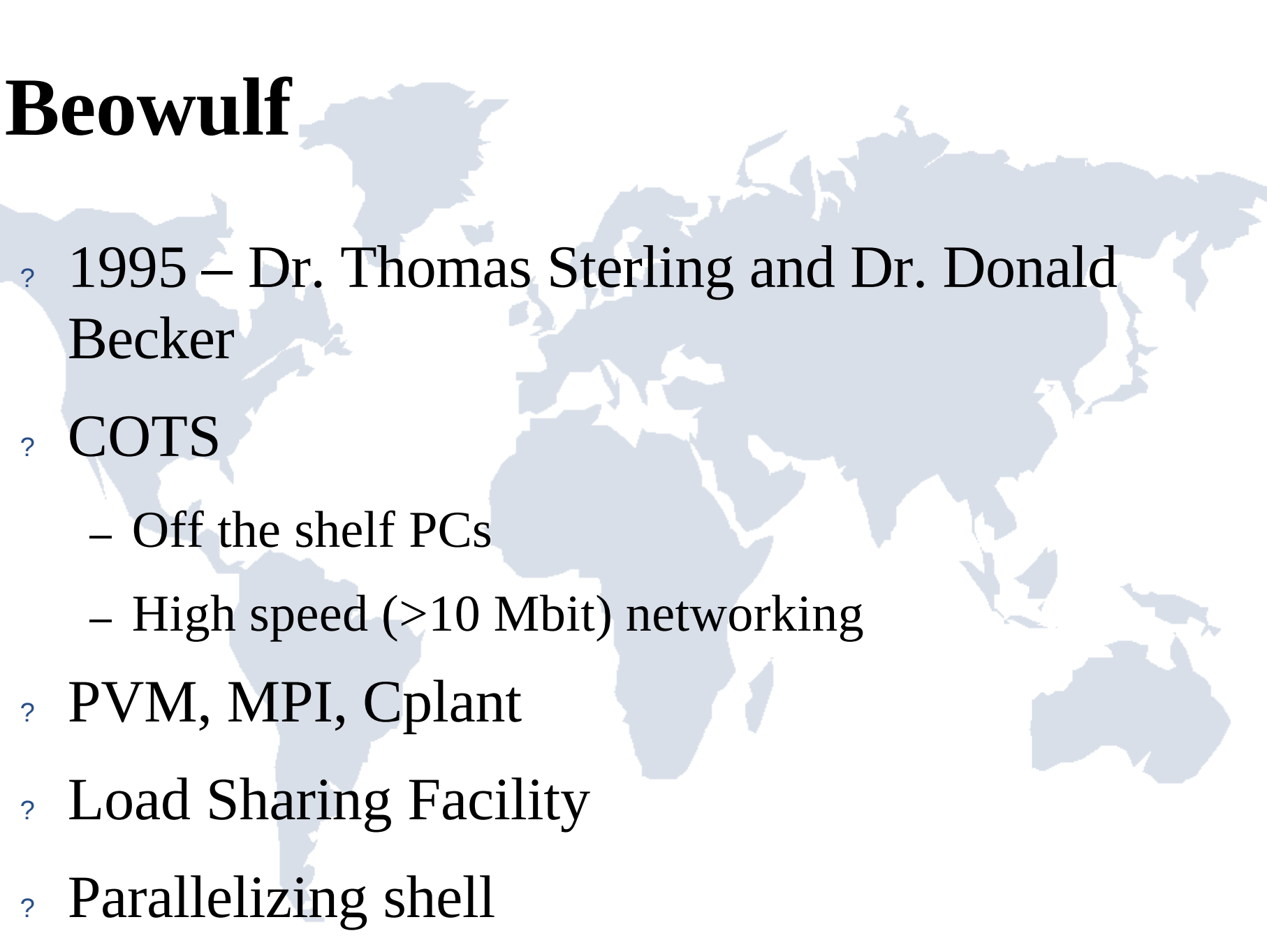
I can train a dog, but do they understand?

Problems With Supercomputers



- ? Very Expensive
 - To design and build
 - To make
 - Software
- ? Few Sold
- ? All Different architectures and operating systems
- ? Super Computer companies going out of business

Beowulf



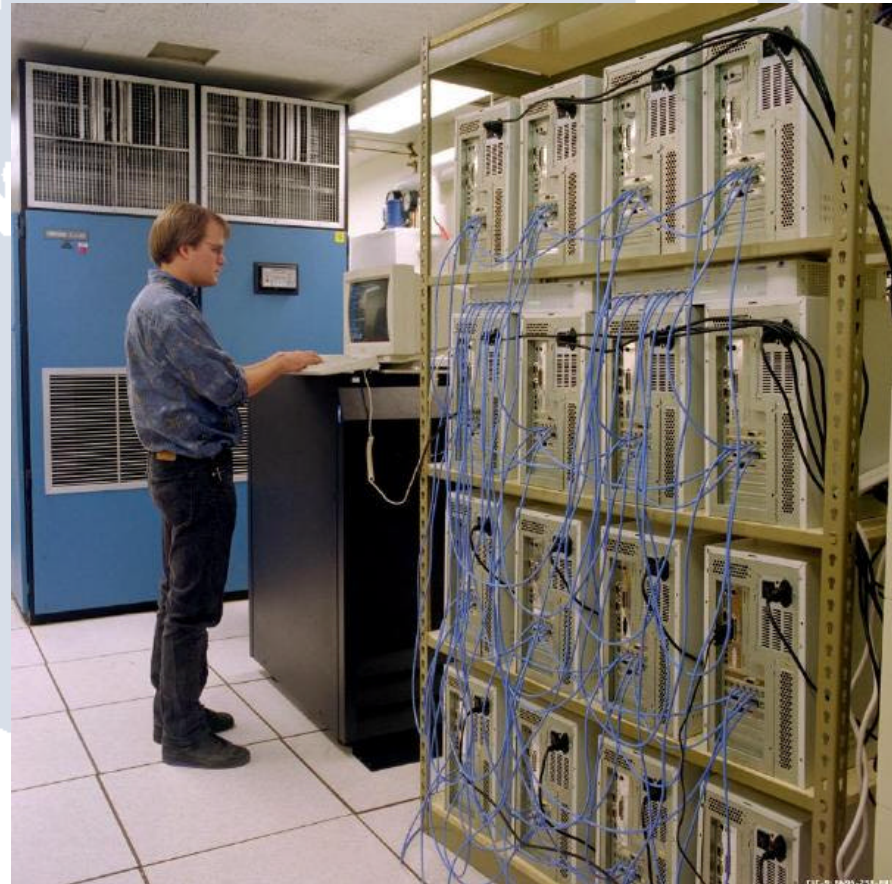
- ? 1995 – Dr. Thomas Sterling and Dr. Donald Becker
- ? COTS
 - Off the shelf PCs
 - High speed (>10 Mbit) networking
- ? PVM, MPI, Cplant
- ? Load Sharing Facility
- ? Parallelizing shell

University of Sao Paulo Brazil – 1997

Supercomputing

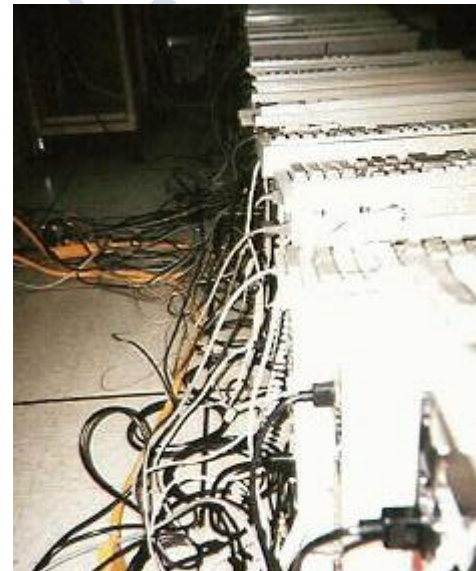
- Real Time Animation
- Treating Disease

this a legitimate use of Linux?



Stone Souper Computer

- ? 48 cast-off computers
- ? 10 Mbit/second
ETHERNET
- ? Real work: mapping
and finding
endangered plants



Embedded Systems

Linux Ideal for Embedded

- Multi-user
 - ? Security built in
- Multi-tasking
 - ? Builds stability
- Multi-threaded
- Multi-architecture
 - ? Important two ways
- Royalty-free

How many kiosks will you need?



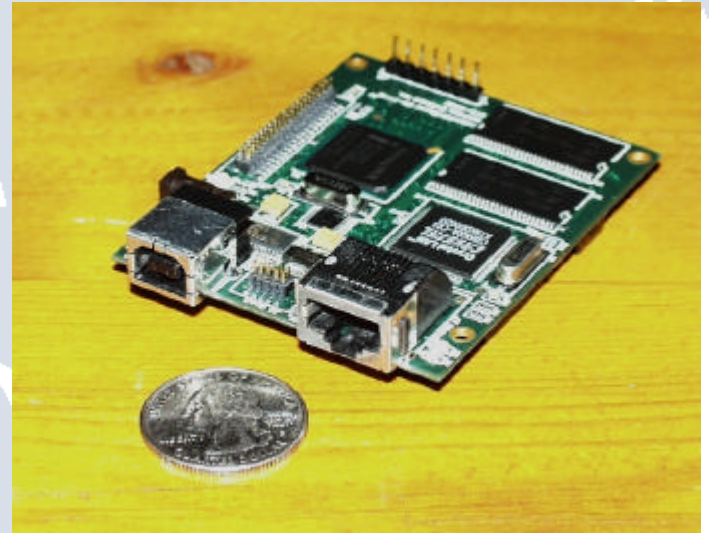
Robots In New Hampshire

- ? RWI, Jaffrey, NH
- ? Robots use 1, 2 or three Linux systems (depending on size) to control them
- ? Customers help them improve OS



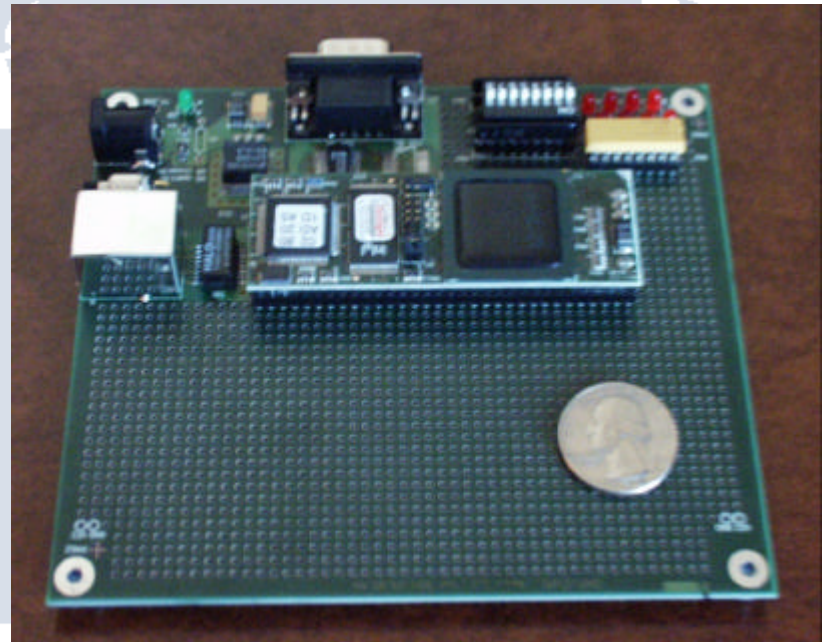
Embedded Systems

- ? StrongARM
- ? 2 Mbyte Flash
- ? 32 Mbyte RAM
- ? ETHERNET
- ? USB
- ? Serial
- ? Parallel
- ? < 1 Watt (without disk)



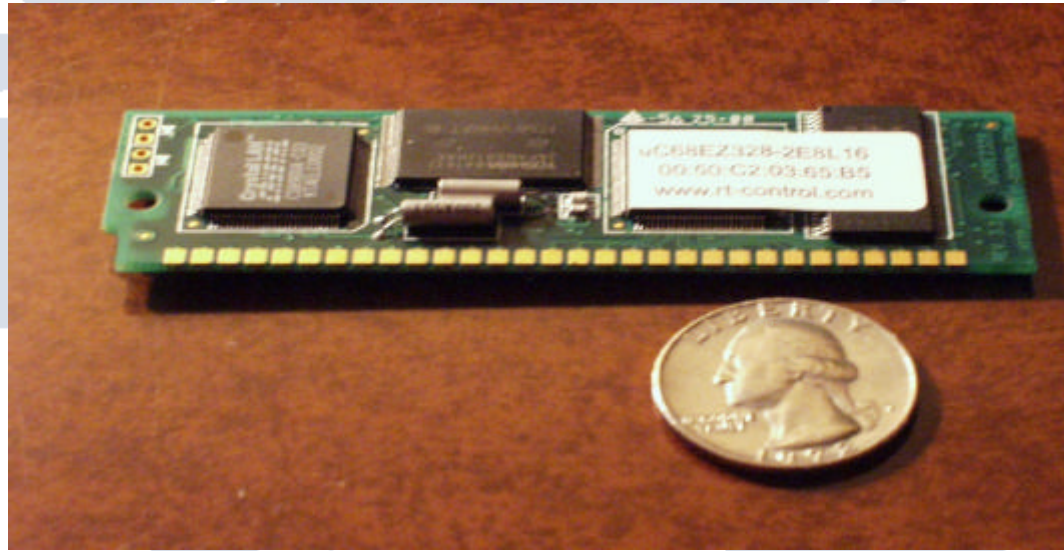
SSV Development System

- ? 486 Processor
- ? 2 Mbytes Flash
- ? 6 Mbytes RAM
- ? ETHERNET
- ? LCD
- ? Serial Lines
- ? Parallel Lines



Smaller Still

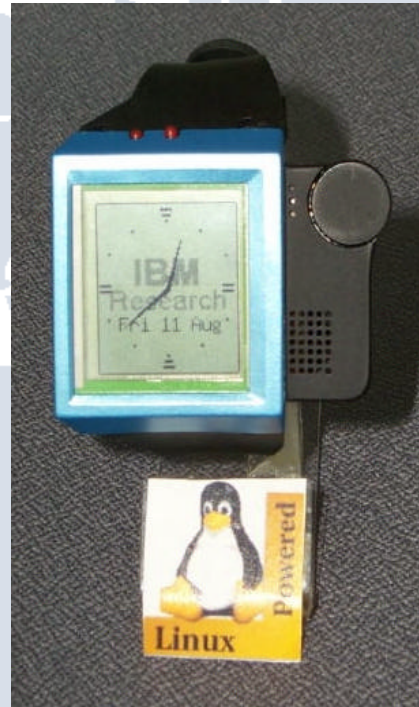
- ? Dragonball processor
- ? 2 Mbyte Flash
- ? 8 Mbyte RAM
- ? ETHERNET
- ? LCD controller
- ? Serial controller
- ? Parallel controller



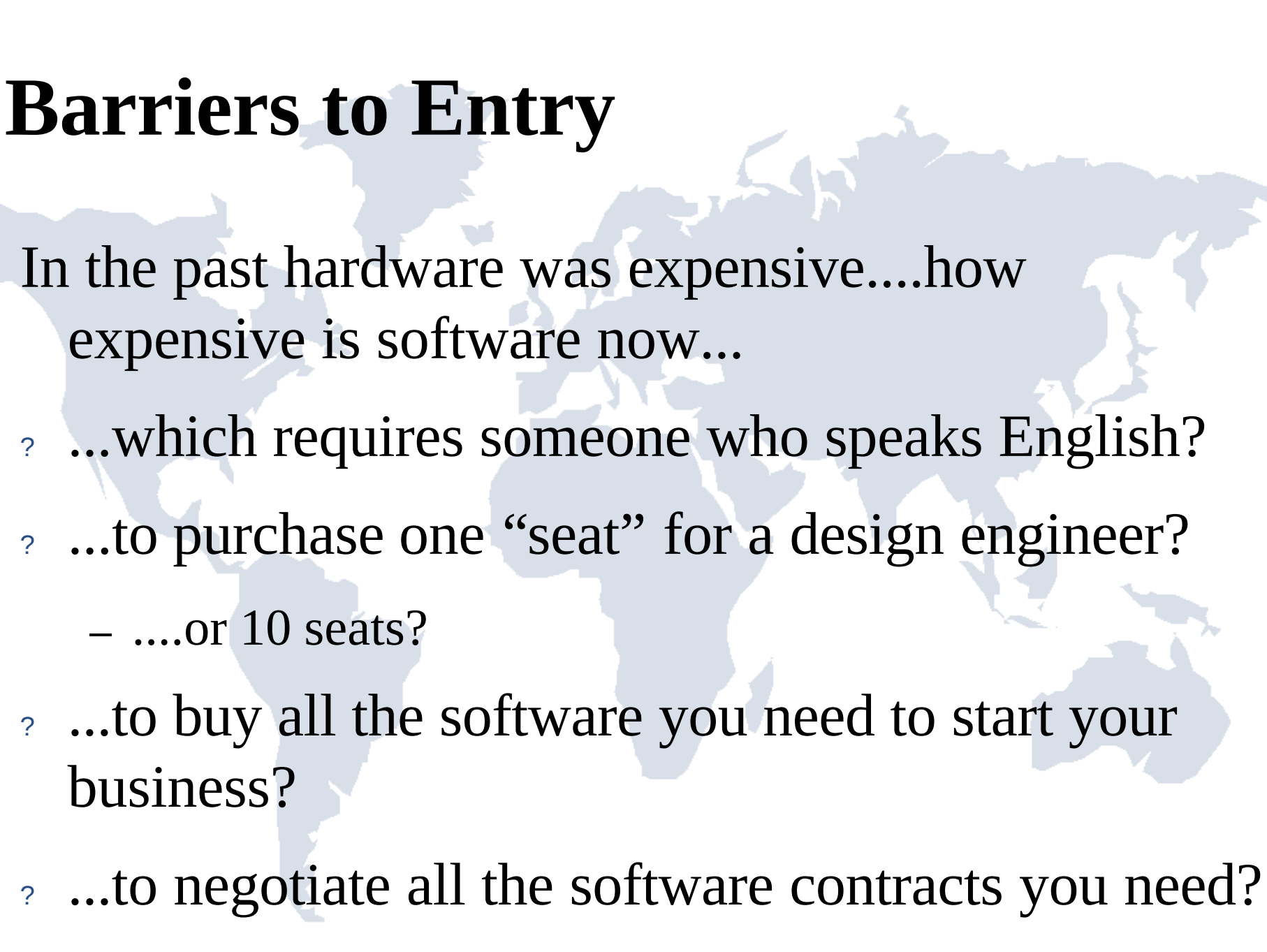
Even Smaller

IBM Research Project

- ? 2 Mbyte flash
- ? 8 Mbyte RAM
- ? Roller Wheel and Touch screen input
- ? IF and RF networking



Barriers to Entry



In the past hardware was expensive....how expensive is software now...

- ? ...which requires someone who speaks English?
- ? ...to purchase one “seat” for a design engineer?
 -or 10 seats?
- ? ...to buy all the software you need to start your business?
- ? ...to negotiate all the software contracts you need?

Rio de Janeiro:

Lowering the Barriers

- ? Company investigating pharmaceuticals
 - Proprietary software
 - ? “Breathtakingly” expensive
 - ? Only in English
 - Open Source
 - ? Postgres database
 - ? Perl
- ? Lowered cost of software for company
- ? Allowed company to exist

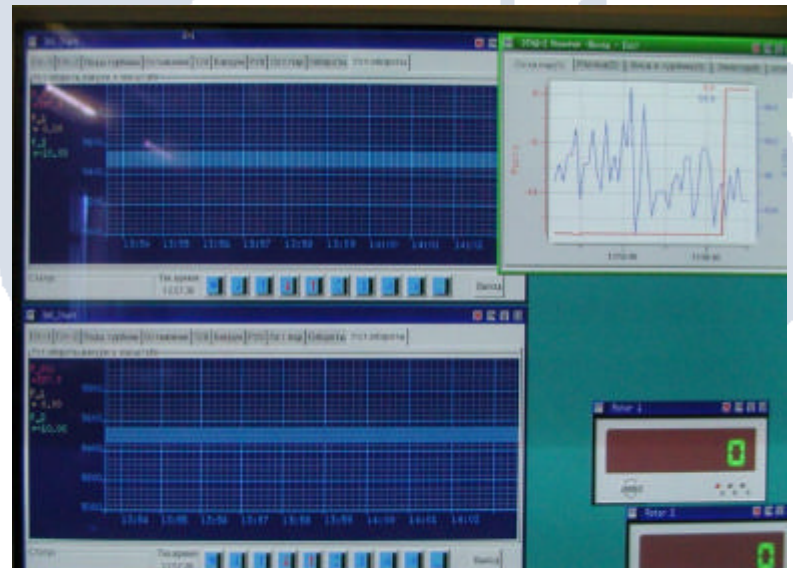
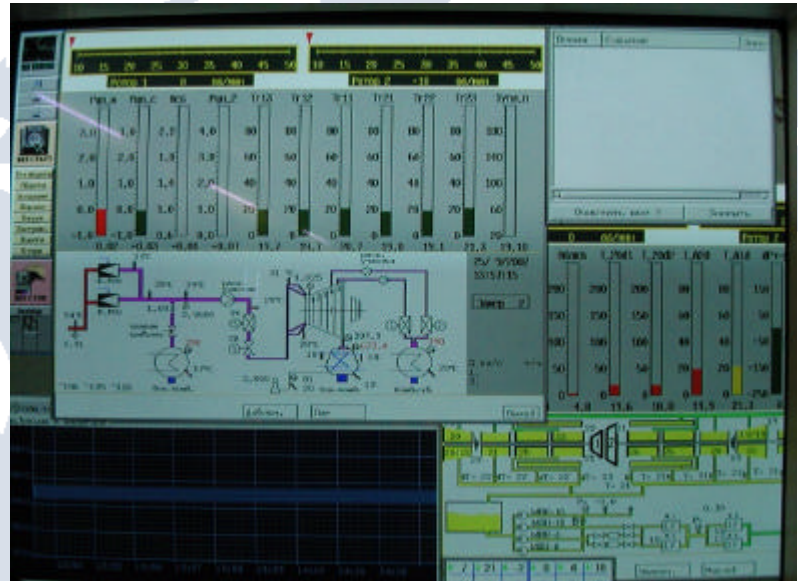
St. Petersburg

- ? Turbine Test Bed
- ? Proprietary Software
 - Expensive
 - Inflexible
 - English

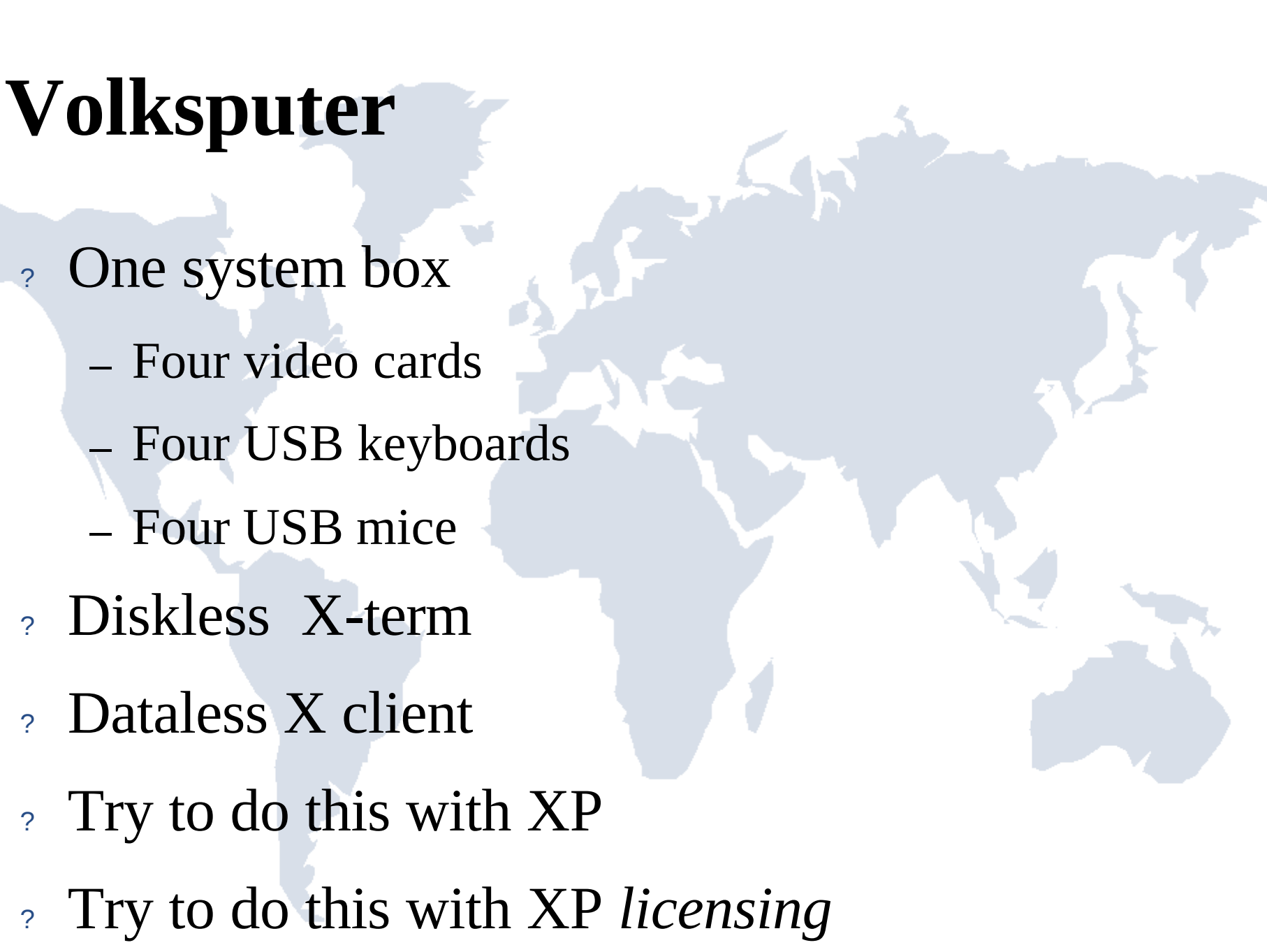


Enter Linux

- ? Software uses
 - MySQL
 - GNUplot
 - Tcl/Tk
 - Python
- ? Less Costly
- ? More Flexible



Volkspüter

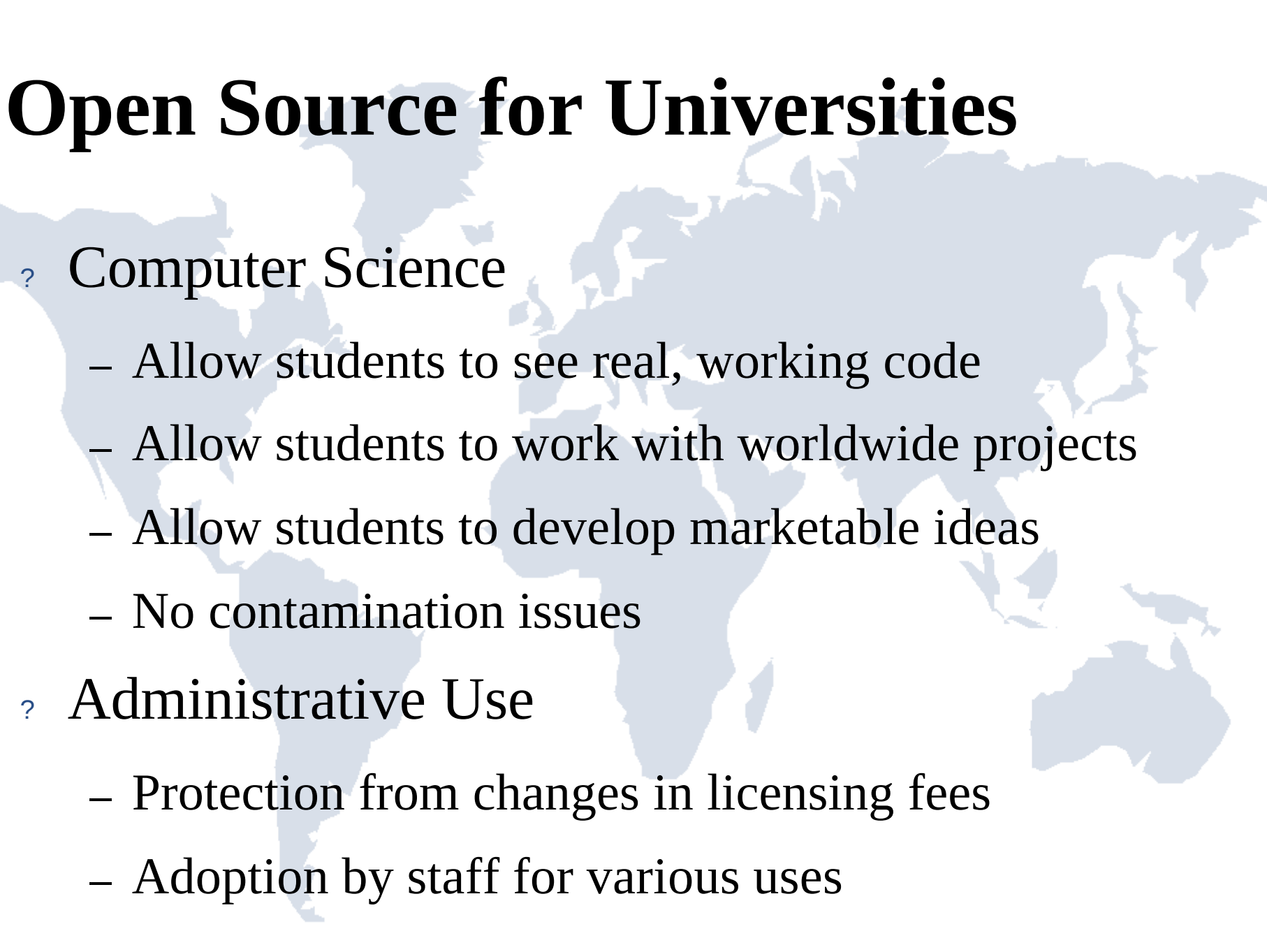


- ? One system box
 - Four video cards
 - Four USB keyboards
 - Four USB mice
- ? Diskless X-term
- ? Dataless X client
- ? Try to do this with XP
- ? Try to do this with XP *licensing*

China Adopts Linux

- ? The world says:
 - Join the Global marketplace
 - Do not pirate software
 - The software is really expensive (for them)
 - ? 700 USD for OS and Office Suite
 - ? Average worker makes 30 USD per month
- ? China funded university students to create low-cost release and office suite

Open Source for Universities



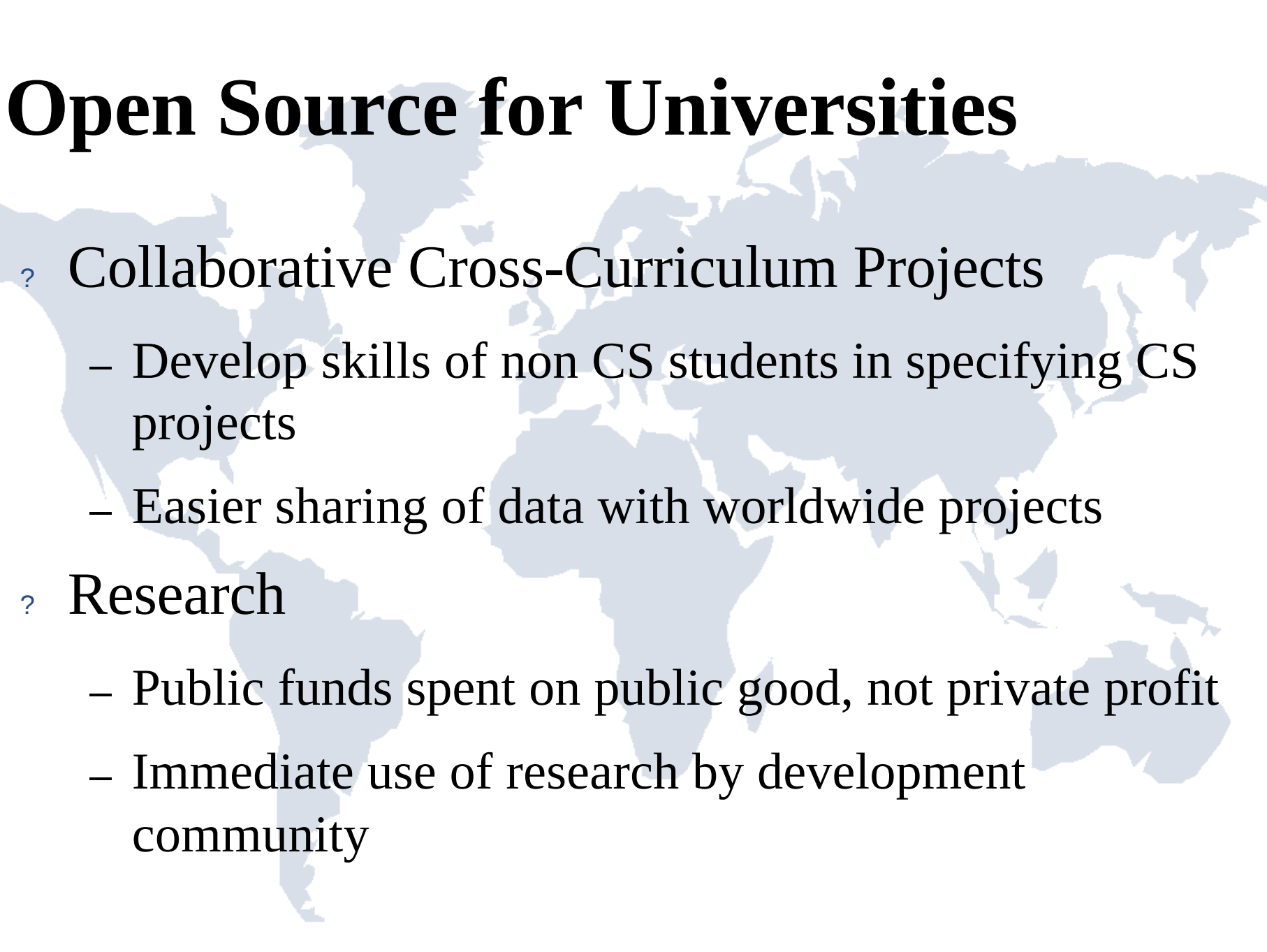
? Computer Science

- Allow students to see real, working code
- Allow students to work with worldwide projects
- Allow students to develop marketable ideas
- No contamination issues

? Administrative Use

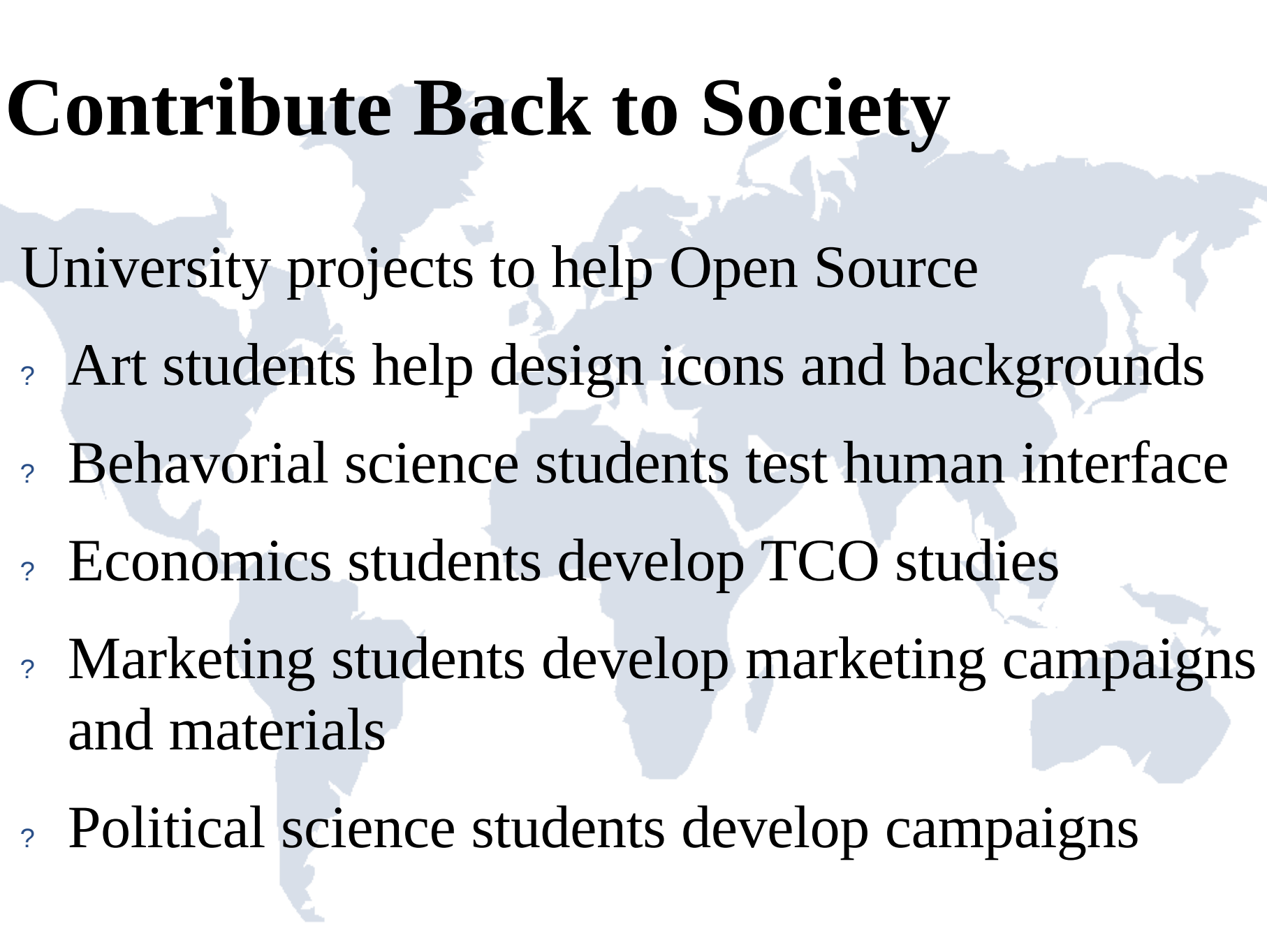
- Protection from changes in licensing fees
- Adoption by staff for various uses

Open Source for Universities



- ? Collaborative Cross-Curriculum Projects
 - Develop skills of non CS students in specifying CS projects
 - Easier sharing of data with worldwide projects
- ? Research
 - Public funds spent on public good, not private profit
 - Immediate use of research by development community

Contribute Back to Society

A faint, light blue world map is visible in the background of the slide, centered behind the text.

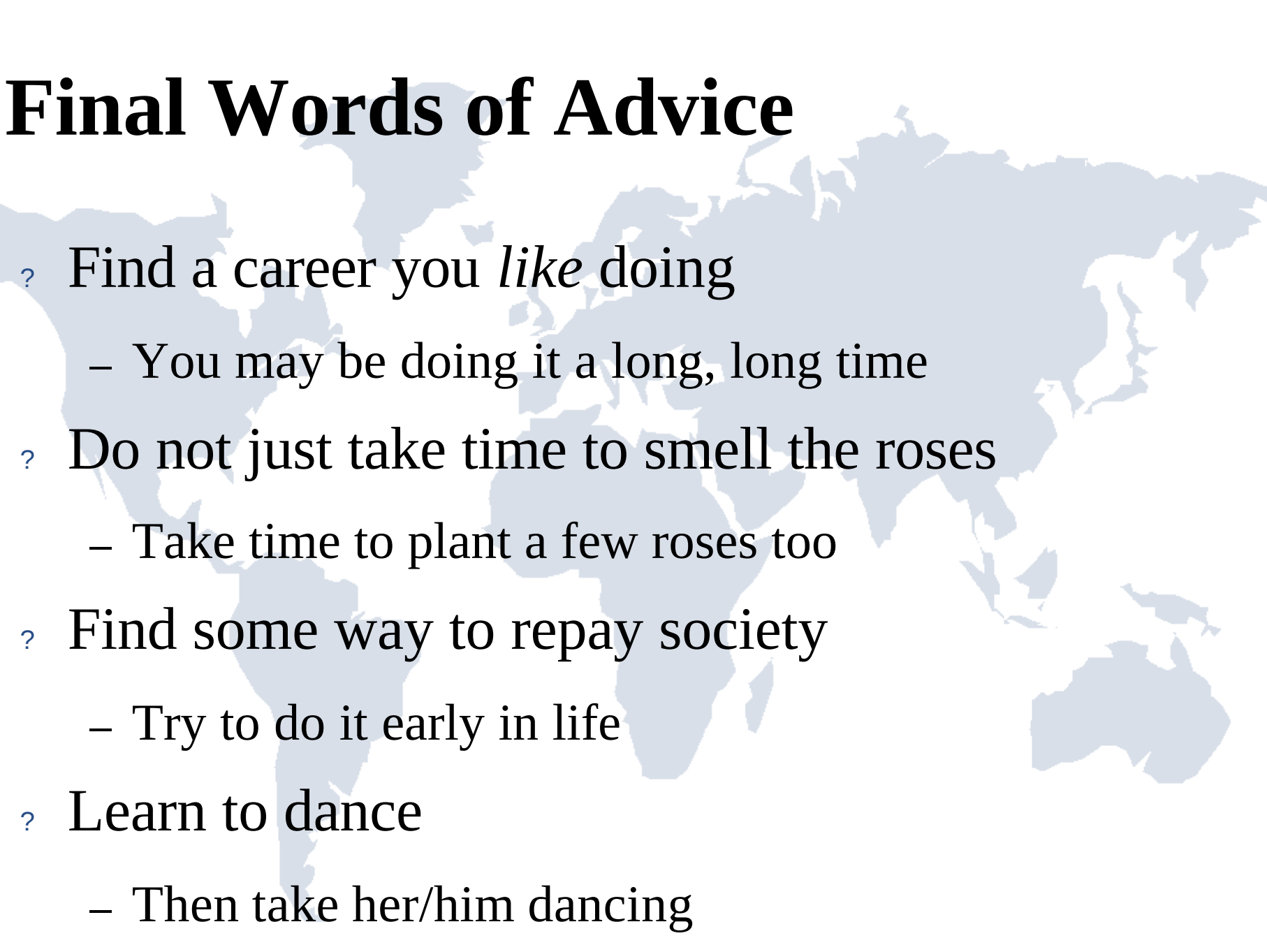
University projects to help Open Source

- ? Art students help design icons and backgrounds
- ? Behavioral science students test human interface
- ? Economics students develop TCO studies
- ? Marketing students develop marketing campaigns and materials
- ? Political science students develop campaigns

What About Jobs For Graduates?

- ? Are your students intelligent or dumb?
- ? Linux is gaining Marketshare
 - 1/3 of all low-to-midrange servers
 - ¾ of all supercomputers (and rising)
 - 3rd most used OS in embedded system projects
 - Current sales of desktops passed Apple
- ? Do you want to teach a product, or a science?

Final Words of Advice

- 
- ? Find a career you *like* doing
 - You may be doing it a long, long time
 - ? Do not just take time to smell the roses
 - Take time to plant a few roses too
 - ? Find some way to repay society
 - Try to do it early in life
 - ? Learn to dance
 - Then take her/him dancing

I Would Like to Thank

- ? Linux International member companies
- ? IBM (for this really cool laptop)
- ? Most of all, the Linux community

University of the South Pacific, Fiji

Any Questions?

From 1200 bps to paradise...

