Why the Best Days of Open Hardware are Yet to Come

bunnie

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In the Beginning...

Model 5X5 Series
(Chassis No. RC-406)
Five-Tube, Single-Band, AC-DC Multiplex Superheterodyne Receiver
Model PLF-10
Power Line Filter Coupling Unit

Electrical and Mechanical Specifications

FREQUENCY RANGE
Receiver ..... 540-1,720 kc
Remote Control Oscillator ..... 540-800 kc

TUBE COMPLEMENT
(1) RCA-12SA7 ..... 1st-Detector-Oscillator
(2) RCA-12C8 ..... I-F Amp., 2nd-Det., and A.V.C.
(3) RCA-12SC7 ..... 1st A-F and Remote Control Osc.
(4) RCA-35L6GT ..... Power Output
(5) RCA-35Z5GT ..... Half-Wave Rectifier

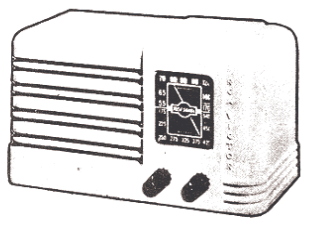
Intermediate Frequency ..... 455 kc

POWER SUPPLY RATINGS
A-C Rating ..... 100-125 volts, 50-60 cycles, 30 watts
D-C Rating ..... 100-125 volts, direct current, 30 watts

POWER OUTPUT (125 volt, 60 cycle supply)
Undistorted ..... 1.5 watts
Maximum ..... 2.0 watts

LOUDSPEAKER
Type ..... 4 inch Electrodynamic
Cabinet Dimensions (inches) Height 5¼, Width 8⅜, Depth 4⅛
Weight (net) ..... 5¼ pounds

General Description



Model 5X5I
RC-406A
Ivory Finish

Model 5X5W
RC-406
Walnut Finish

The following features are incorporated in the design of the Little Nipper Multiplex 5X5 Series Receiver:

First, it is a "standard broadcast" receiver. Second, it will operate any other radio in the home by "remote control" without the use of connecting wires. Third, records may be reproduced through the Little Nipper when used with Victrola Attachment. Fourth, the Model 5X5 (when used with Victrola Attachment) will reproduce records through any other radio in the home without the use of connecting wires.

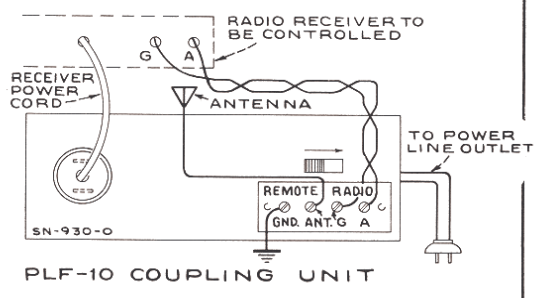
When using the 5X5 as a remote control, the Model PLF-10 Power Line Filter Coupling Unit should be used in conjunction with the receiver to be controlled. The filter is connected between the power line receptacle and the receiver being controlled, as shown in accompanying drawing.

Set-up Procedure for Remote Control

1. Install the 5X5 and tune in any desired station.
2. Turn the control switch on the back of the 5X5 to its clockwise position marked "Remote." The 5X5 becomes silent.
   The 5X5 now becomes a small relay station for signalling to the controlled receiver via the power line wiring.
3. Next tune the main receiver to the exact frequency of transmission of the 5X5, usually 540 kc. Tune carefully to this frequency, setting the volume control as high as permissible with regard to hum and noise conditions. The station to which the 5X5 was tuned will be heard. If the receiver is equipped with tuning indicator (Magic Eye) the correct point will most easily be obtained by observing the indicator.
4. Now any station tuned in on the 5X5 dial will be heard on the controlled receiver. The volume will also be controlled with the 5X5 volume control.
5. If it is desired to operate the controlled receiver on its own controls it is only necessary to set the switch on the Power Line Filter Coupling Unit to its position marked "Radio."
6. In the event that, with the 5X5 being used as a remote control, other receivers in the home are in use, trouble may be experienced due to noise and hum. To avoid this, connect a Power Line Filter Coupling Unit, RCA Victor PLF-10, to each of these other receivers, as shown in accompanying drawing.

Precautionary Lead Dress

1. Dress 1st I-F plate and grid leads against chassis and away from each other. Dress plate lead from 12C8 close to chassis.
2. Dress A.V.C. condenser (0.1) close to chassis and tight to 0.25 mfd. condenser.



PLF-10 COUPLING UNIT

Alignment Procedure

Output Meter Alignment.—Connect the meter across the voice coil, and turn the receiver volume control to maximum.

Test-Oscillator.—Connect the low side of the test-oscillator to the receiver chassis, through a .01 mfd. capacitor, and keep the output as low as possible.

The Remote Control Oscillator in the 5X5 is set at the factory to approximately 540 kc. The frequency may be varied between 540 and 800 kc to suit local conditions by adjusting the trimmer condenser C7.

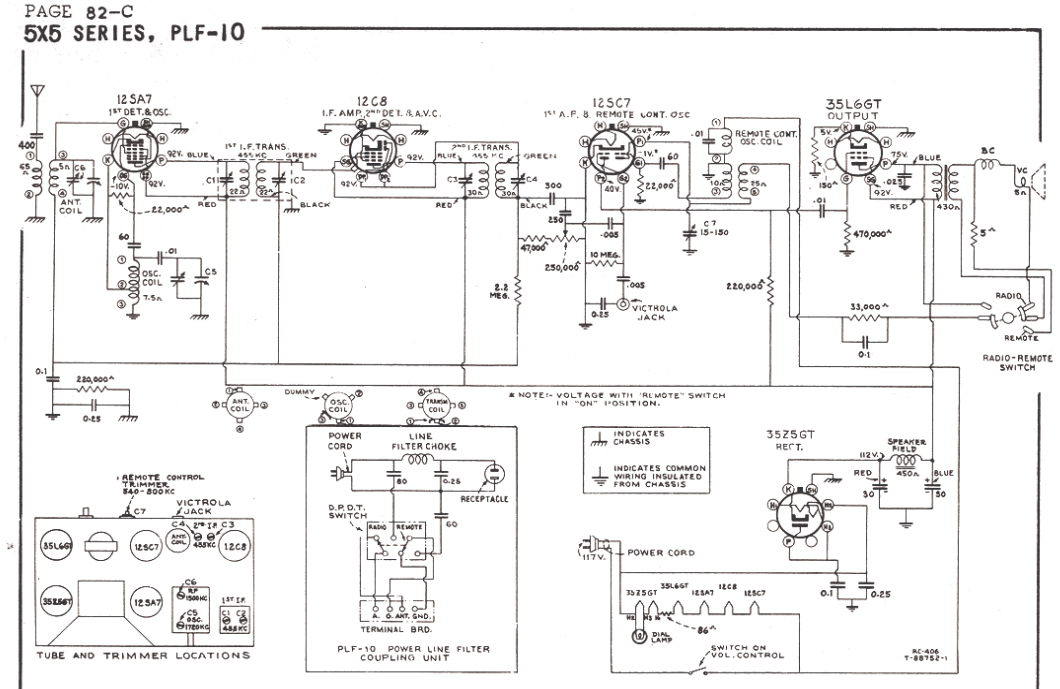
Power-Supply Polarity.—For operation on d-c, the power plug must be inserted in the outlet for correct polarity. If the set does not function, reverse the plug. On a-c, reversal of the plug may reduce hum.

If the electric supply circuit is a three-wire system, it may be necessary to connect a ½ mfd 700-volt capacitor between the two outside lines of the three-wire system.

Antenna.—The set is equipped with length of antenna wire. Do not connect the antenna to ground. If an outdoor antenna is used, it should not be longer than 100 feet, including lead-in. If it is longer, connect a 100 to 200 mmf. capacitor in series with the lead-in.

Victrola Attachment.—A jack is provided on the rear of chassis for connecting a Victrola Attachment into the audio-amplifying circuit. The cable from the Victrola Attachment should be terminated in a Stock No. 31048 plug to fit the jack.

Steps	Connect the high side of test-oscillator to—	Tune test-osc. to—	Turn radio dial to—	Adjust the following for max. peak output—
1	Tuning condenser stator (osc.) in series with .01 mfd.	455 kc	Quiet point at 1,600 kc end of dial	C1, C2, C3, C4 (1st and 2nd I-F transformers)
2	Antenna term. of ant. trans. in series with 100 mmfd.	1,720 kc	Full clockwise (out of mesh)	C5 (oscillator)
3		1,500 kc	Resonance on 1,500 kc signal	C6 (antenna)



Replacement Parts

Insist on genuine factory-tested parts, which are readily identified and may be purchased from authorized dealers.

STOCK No.	DESCRIPTION	STOCK No.	DESCRIPTION
	CHASSIS ASSEMBLIES	32969	Socket—Dial lamp socket
13057	Capacitor—60 mmfd.	14278	Socket—Phonograph socket
12488	Capacitor—250 mmfd.	32537	Socket—Tube socket
12952	Capacitor—300 mmfd.	30585	Spring—Drive cord spring
30433	Capacitor—400 mmfd.	33319	Transformer—First i-f transformer
4838	Capacitor—.005 mfd.	32578	Volume control and power switch
4937	Capacitor—.01 mfd.		**POWER LINE FILTER PLF-10**
4870	Capacitor—.025 mfd.	13057	Capacitor—60 mmfd.
4839	Capacitor—0.1 mfd.	12484	Capacitor—0.25 mfd.
12484	Capacitor—0.25 mfd.	33492	Coil—Choke coil
33321	Capacitor—Electrolytic, 2 sections 30 mfd. each	33493	Receptacle—Power receptacle
32572	Coil—Antenna coil	33491	Switch
33320	Coil—Duplex oscillator coil		**SPEAKER ASSEMBLIES (39105—2)**
32962	Coil—Oscillator coil		
33323	Condenser—Trimmer 20-150 mmfd.	32964	Transformer—Output transformer
32968	Condenser—2-gang variable tuning		**MISCELLANEOUS ASSEMBLIES**
32634	Cord—Drive cord	X-639	Cabinet—Ivory finish—Model 5X5I (net)
32946	Drum—Condenser drive drum	X-638	Cabinet—Walnut finish—Model 5X5W (net)
12409	Lead—Antenna lead	32942	Dial—Glass dial scale
33322	Resistor—5 ohms, 5 watts	33317	Fastener—Push fastener to hold cabinet back
14871	Resistor—33 ohms, ½ watt	33306	Knob—Black tuning knob—Model 5X5I
13428	Resistor—150 ohms, ½ watt	32447	Knob—Ivory knob—Model 5X5W
13998	Resistor—22,000 ohms, ½ watt	32943	Nut—Speed nut to hold dial
12454	Resistor—33,000 ohms, ½ watt	31646	Spring—Knob retaining spring
12412	Resistor—47,000 ohms, ½ watt		
12264	Resistor—220,000 ohms, ½ watt		
12285	Resistor—470,000 ohms, ½ watt		
12679	Resistor—2.2 meg., ½ watt		
13601	Resistor—10 meg., ½ watt		
32945	Shaft—Tuning knob shaft and bushing		

Additional Replacement Parts:

Stock No.	
32946	Drum—Condenser drive drum and indicator
11765	Lamp—Dial lamp, Mazda No. 51
33324	Switch—"Remote" switch
32967	Transformer—Second I-F trans.
34569	Speaker—Complete—less transformer

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Addendum to the

Apple II Reference Manual

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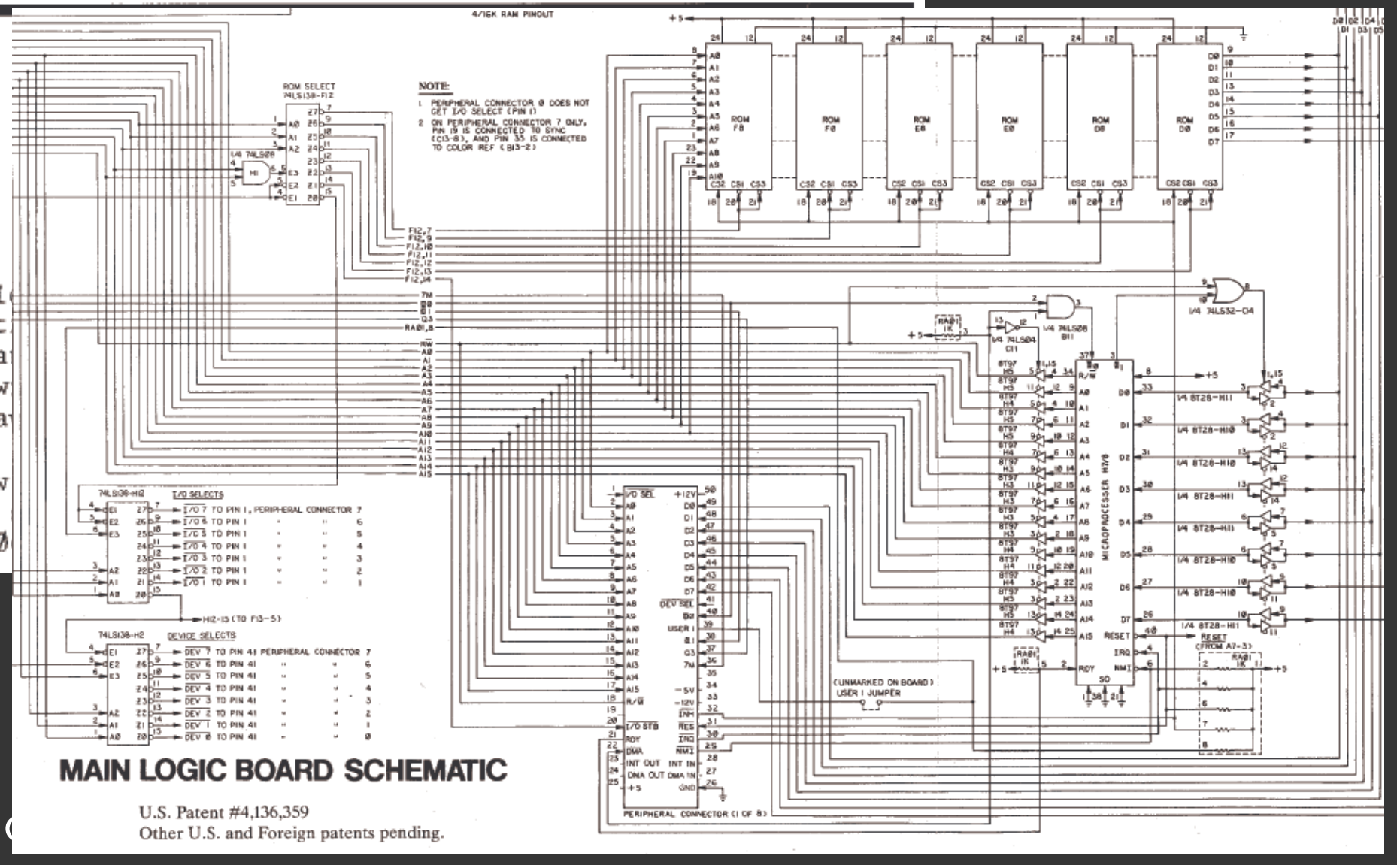


MAIN LOGIC BOARD SCHEMATIC

U.S. Patent #4,136,359
Other U.S. and Foreign patents pending.

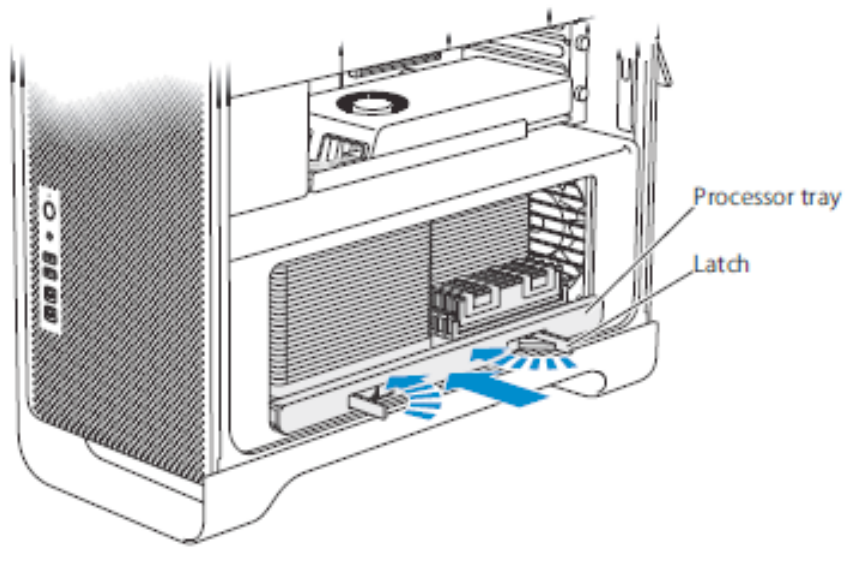
Sep 15, 2011 - (

But Today...

Congratulations, you and your Mac Pro were made for each other.

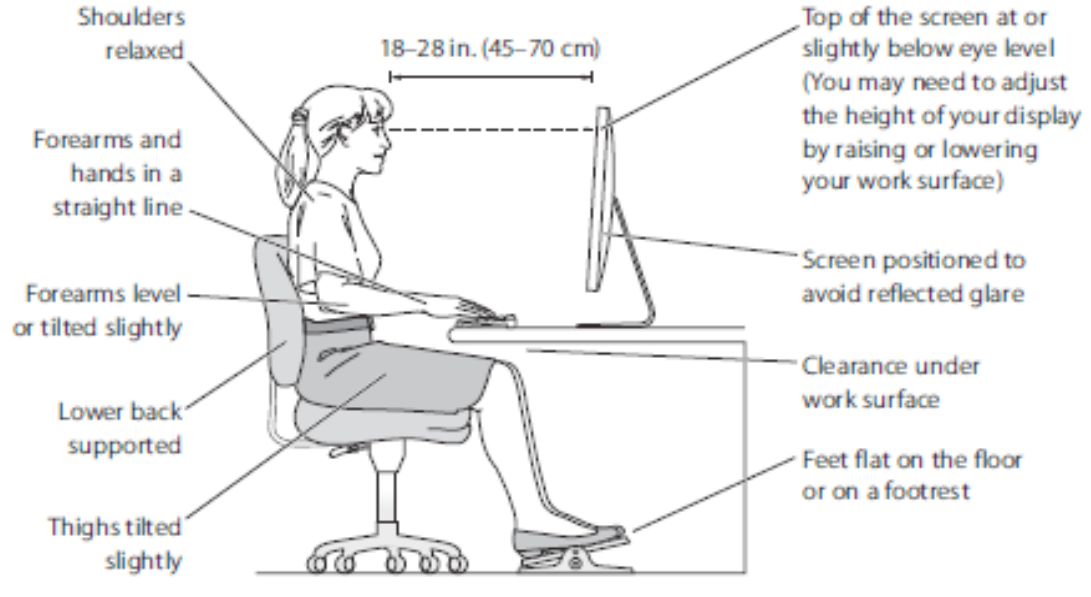
6 Reinstall the processor tray, pushing it in until the latches are at a 90-degree angle.

7 Push the latches all the way in to close them and seat the processor tray.



8 Replace the side panel, following the instructions starting on page 52.

NOTICE: Always replace the side panel after installing components. Your Mac Pro doesn't operate properly without the side panel in place.



More information about ergonomics is available on the web:

www.apple.com/about/ergonomics

What Happened?

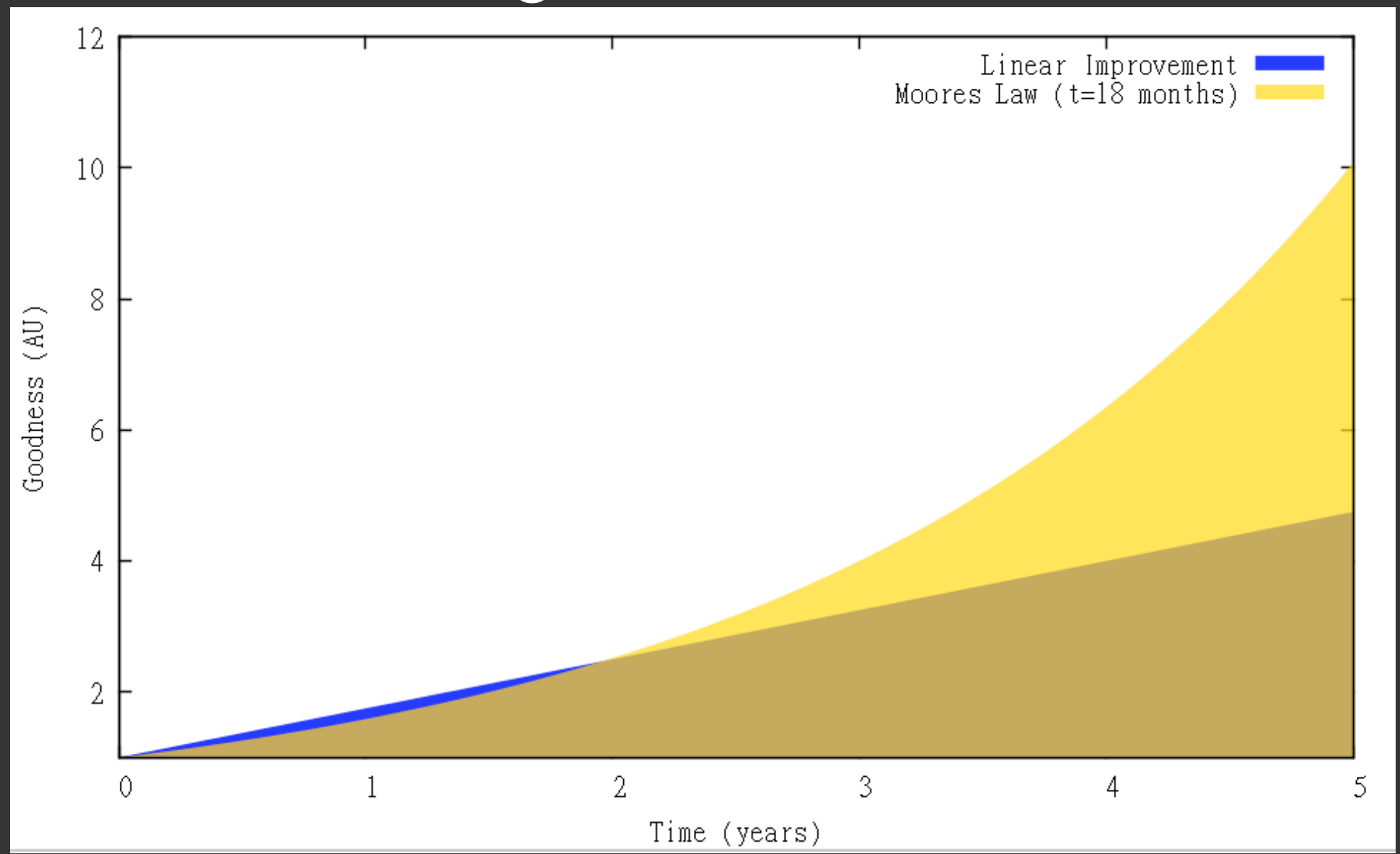
What Happened?

Did hardware become too hard and complex?

No!

- Actually, hardware is far too *"easy"* to improve

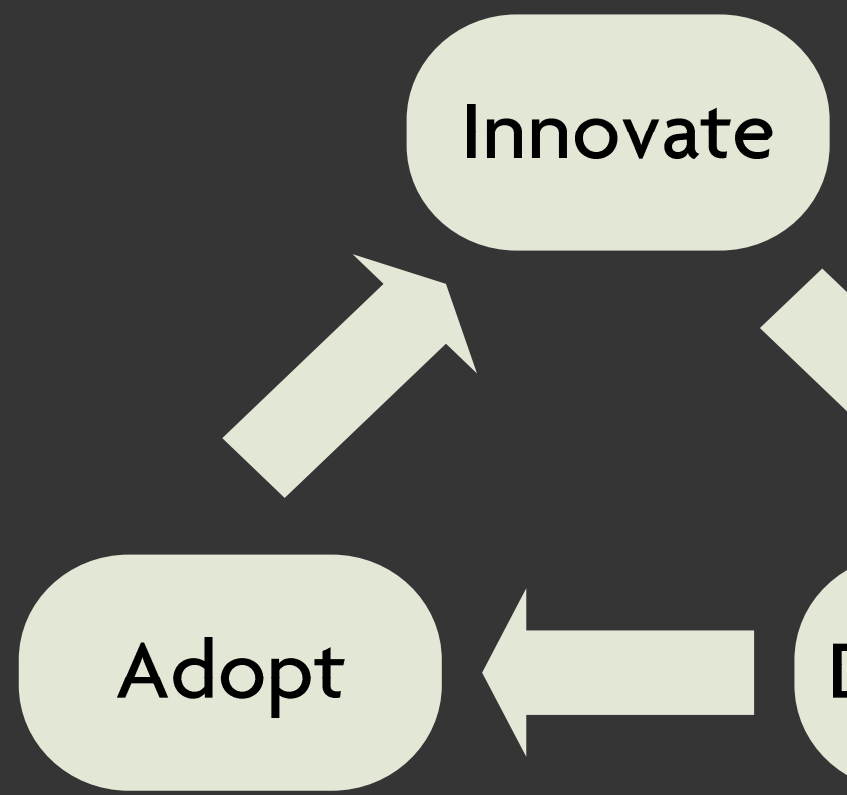
The Unrelenting Treadmill of Moore's Law



Hardware's Classic Problem:
"Sit and Wait" >> Innovate

The Product Cycle

S: days to weeks
H: weeks to months



Total cycle time:

Software: weeks-months

Hardware: months-years

S: weeks to months
H: months to years

S: seconds to minutes
H: months

Moore's Law Favors Big Business

- "Product pipelines"
  - 2-3 generations in simultaneous development
- "Massive distribution"
  - Infrastructure to build, deploy millions per month
- "Secrecy"
  - Secrecy delays competition by a few months
  - With tech doubling every 18 mos, that's a big advantage

This Too Shall Pass.

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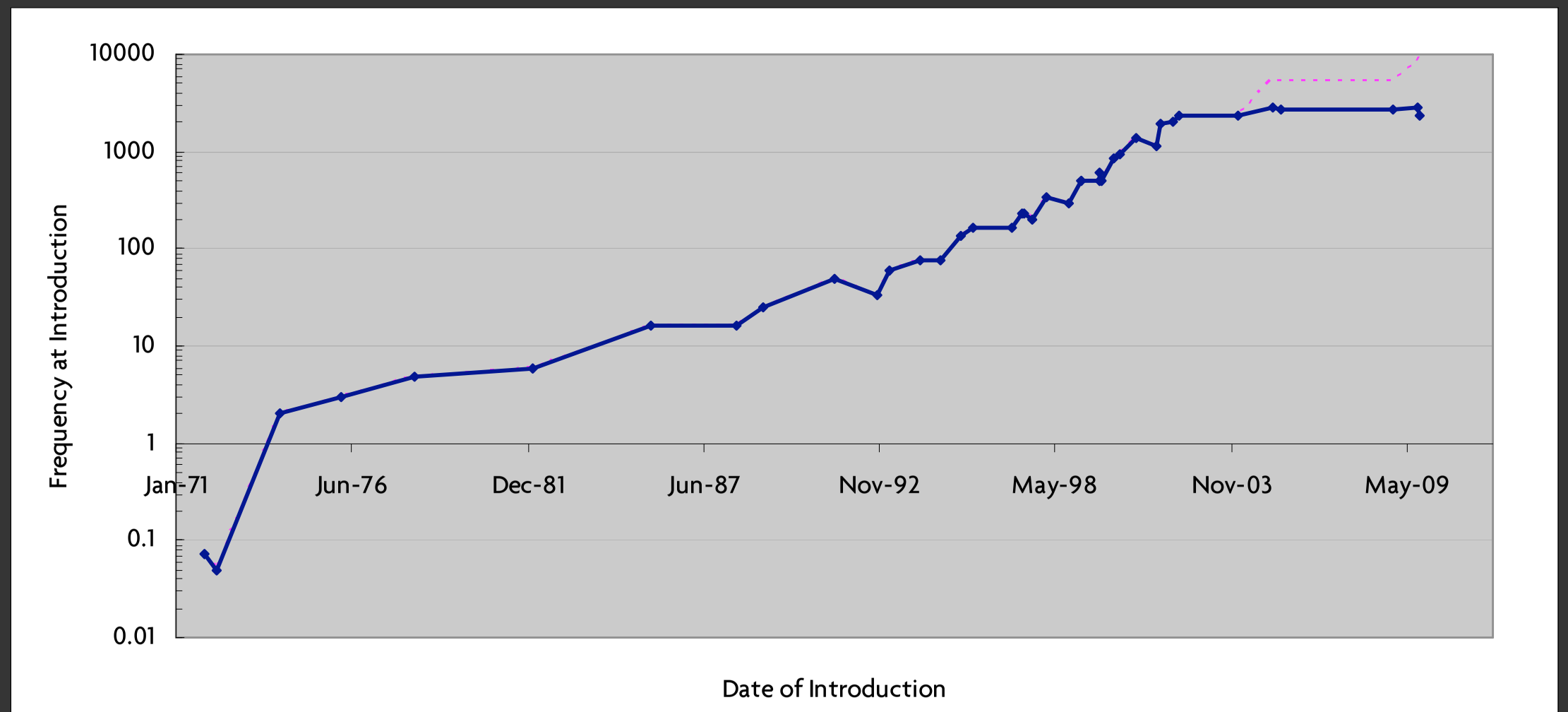
Clock Scaling Ended Around 2003



Moore's Law is Slowing Down

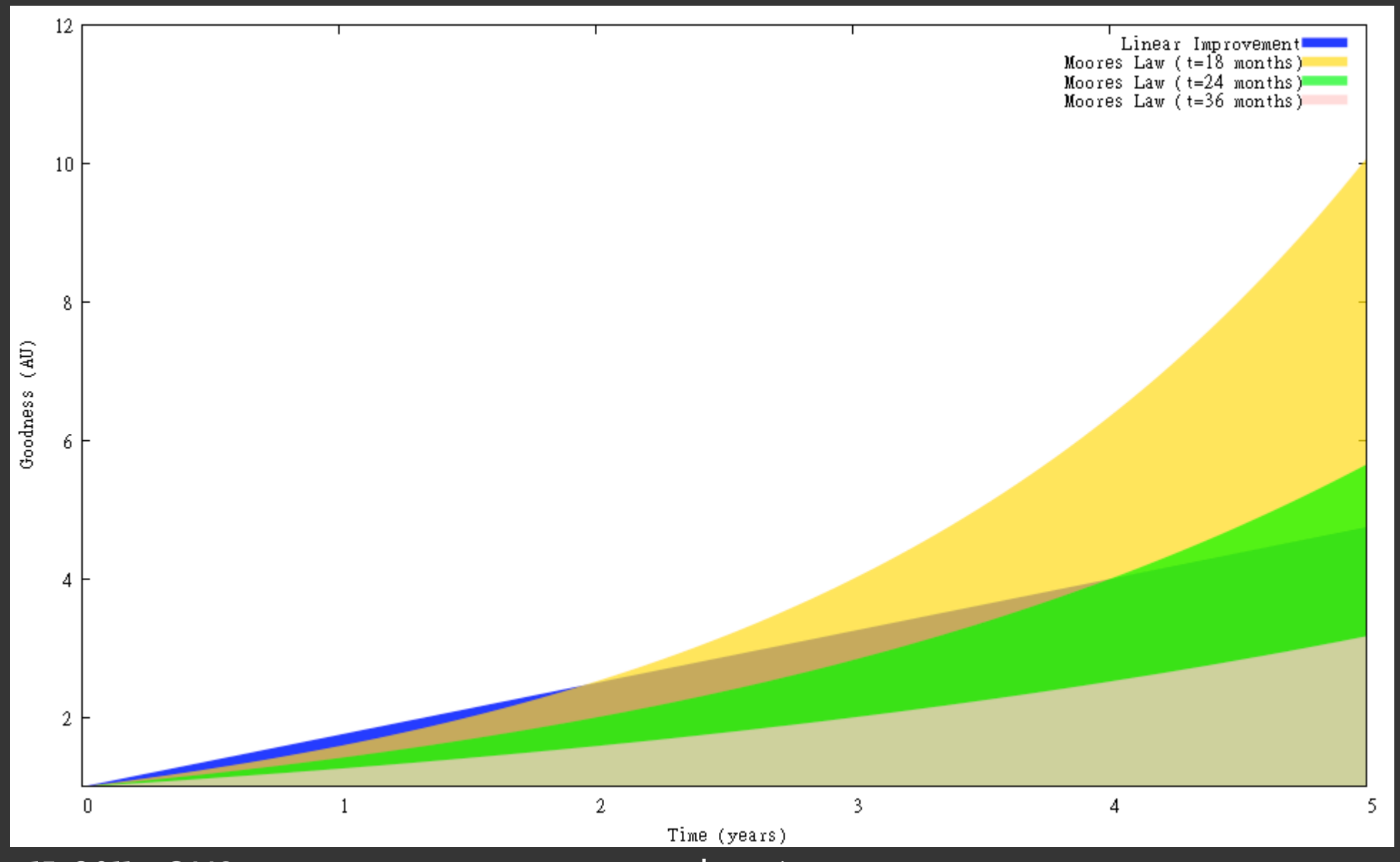
- Density doubling rate is now "officially" every 24 months
- Certain fundamental transistor parameters have hit a wall already – V_{th}, V_{ddmin}, gate oxide thickness
- Where does it end?
  - Sometime between 2020-2030, gate length = 5nm
    (H. Iwai, Microelectron. Eng. (2009), doi:10.1016/j.mee.2009.03.129)

What Does this Mean For You?

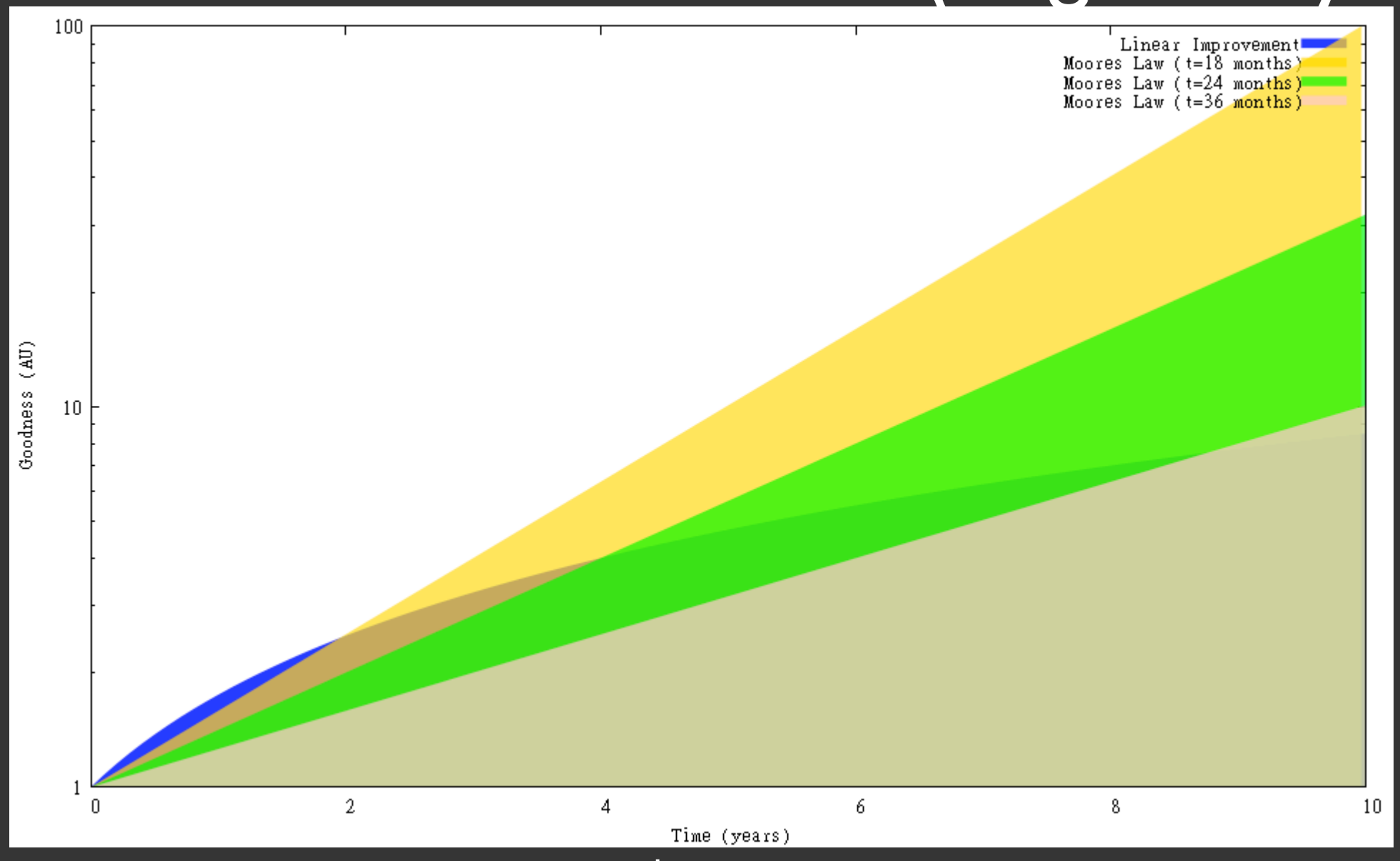
- Someday:
  - Your computer won't get any faster next year.
  - Your phone won't get any smaller next year.
  - Your flash drive won't store any more data next year.

This is Good News For Us.

Moore's Law Revisited



Moore's Law Revisited (Log Scale)



Implications

- The life cycle of hardware is a better fit for smaller organizations
- A higher value on optimization, craftsmanship
- More stable, common platforms

Things to Look Forward To

- Arduino-like devices as powerful as your smartphone*
- Competitive DIY chassis for notebooks, tablets
- FPGAs that perform comparably to CPUs
- A rise in “repair culture”

Example Indicator

- Shanzhai mobile phone culture in China
  - "Trailing edge" technology satisfies a large market segment
  - Small shops are very competitive and profitable
  - Lots of re-use and re-processing of parts

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Conclusion

- "Exponentials are never forever"
- With every passing year, the standards and customs our open hardware community makes become more "sticky"

- The best years of Open Hardware are yet to come!

Thanks!