

Introduction to Computer Audio

Part I: USB

Mike Prager
Portland Audio Club
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Why computer audio?



- Play high-resolution files
- Access your music from more than one location
- Catalog your music & find it easily
- Enjoy great fidelity
- Stop accumulating physical media
- Explore something new
- Use streaming services (Tidal, etc.)

Why not computer audio?

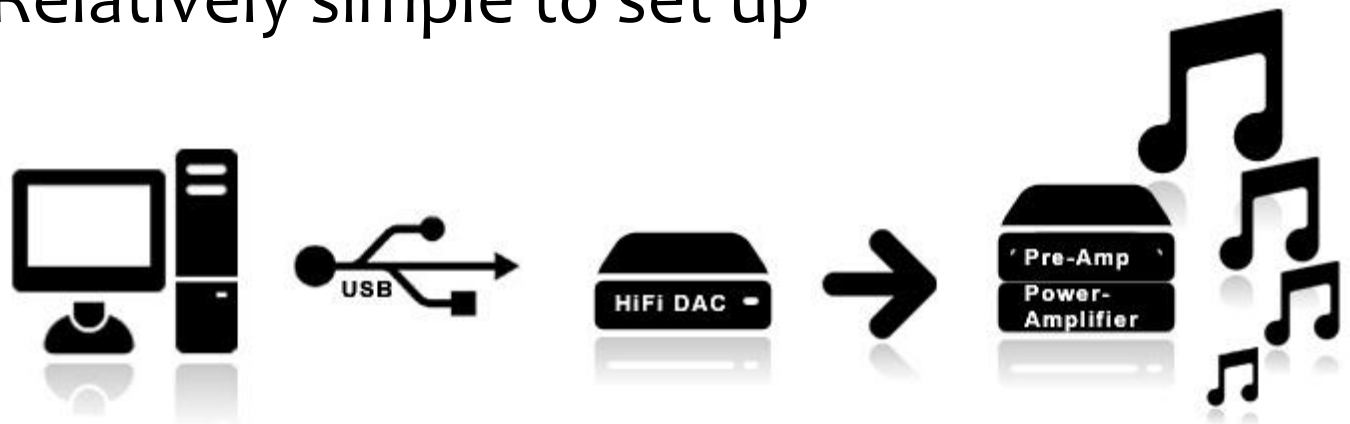
- You hate computers.
- You don't have spare time:
 - Learning curve, setup
 - Ripping your library
- You might need more gear.
- You are already in audio nirvana.



Two Types of “computer audio”

- #1: USB Audio

- Topic of today's talk
- Plays music from a computer disk to your audio system, **via a USB connection**
- Your computer is a source component, like any other
- Relatively simple to set up



Two Types of “computer audio”



- **#2: Networked Audio**

- Plays music from a computer disk to your system, **via your home network**
- Computer or NAS runs a *server* program
- A tablet controls playback through a specialized app.
- Audio is received in the audio room by a network-compatible *renderer*, which may be integrated with a DAC.

USB Audio: what you need

- A computer and software
- Disk storage for your music
- A USB cable
- A DAC with USB input
- The rest of an audio system
- A backup method for your files

USB Audio: pros & cons

vs. Networked audio

- Pros
 - Relatively simple
 - Less to learn, go wrong (vs. network audio)
 - Excellent fidelity
- Con
 - A computer in your audio room
 - *But*, it could be a silent computer with remote control app



Networked Audio: what you need

- A computer and software
- Disk storage for your music
- Reliable, speedy home networking
- A server program (DLNA or Roon)
- A stream receiver (renderer)
 - An integrated or separate DAC
- A *control point* app on a tablet or phone
- A backup method for your files

Networked Audio: pros & cons

- Pros
 - **No** computer in the audio room
 - Set up one server, receive everywhere
 - Audio room, living room, bedroom, exercise bike
 - Possibly over the net
 - Equal fidelity to other sources
- Cons
 - More complex to set up, troubleshoot
 - More equipment & software needed
 - Requires stable, fast networking

A word about Bluetooth



\$189

- Inexpensive
- Easy to set up
- Great with a phone
- *Mike's take:* Similar to a very-high-quality (320kbps) mpg file, **which sounds very good in most situations**

USB or Network?

- Why not both?
- Start with USB, add networking
- Same files, tagging, storage needs, and backup systems





USB AUDIO EQUIPMENT AND HOOKUP

Your computer could be
a cool computer ...

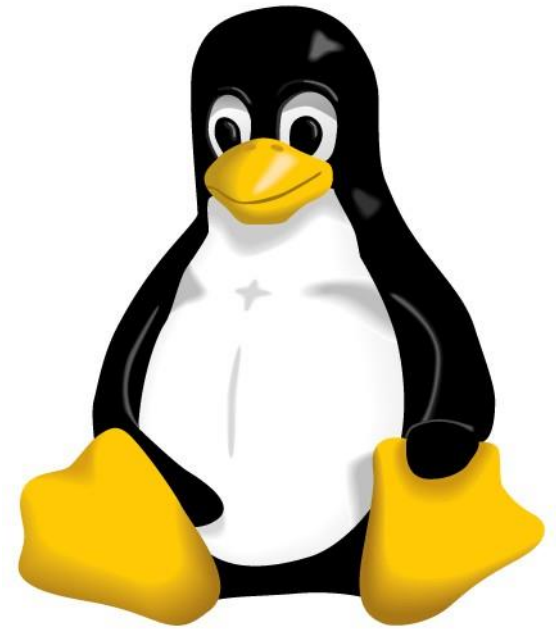


A boring computer



A cheap computer

**FREE
GEEK**



\$100



Choosing a computer for USB audio

- One you own
- A quiet one
- The OS you know
- Maybe even your phone?
- For Roon, one that's powerful enough

A USB cable



You purchased this item on February 16, 2014.

[View this order](#)

Belkin

Belkin Gold Series 10-Foot Hi-Speed USB 2.0 Cable



[36 customer reviews](#)

Price: **\$20.29** & **FREE Shipping**

Note: Not eligible for Amazon Prime.

Only 10 left in stock - order soon.

Get it as soon as July 11 - 14 when you choose **Expedited Shipping** at checkout.

Ships from and sold by [Bridge Tx](#).

Eligible for [amazon smile](#) donation.

- 10-foot USB 2.0 cable connects peripherals to your computer
- Gold-plated connectors optimize conductivity
- Supports speeds up to 480 Mbps
- Shield minimizes radio and electromagnetic interference
- Comes with manufacturer's lifetime warranty

Another USB cable



Oyaide Cables

Oyaide NEO d+: Class A USB 2.0 A to B Flat Cable, 1.0m (3.28 ft) - Black/Orange



12 customer reviews

Price: \$50.00 ✓prime

Only 6 left in stock - order soon.

Want it Sunday, July 9? Order within **1 hr 54 mins** and choose **Two-Day Shipping** at checkout. [Details](#)

Sold by [STOKYO](#) and [Fulfilled by Amazon](#). Gift-wrap available.

- high performance USB cable w/ unique flat design
- transfer speed: Maximum 480Mbps

Yet another USB cable



Crystal Cable Crystal USB Absolute Dream

BRAND: Crystal Cable

LENGTH: 2.0 meter [\$15300.] ▼

QTY: 1 ▼

\$15,300.00

ADD TO CART



Choosing a USB cable

- Start with a cheap, reliable one.
- If you buy an expensive one, you **may** hear a difference.
- Someone else **might not**.
- *Mike's take:* a **low priority** for upgrade

And check the connectors!



USB A-Type



USB B-Type



USB C-Type



Micro-USB A



Micro-USB B



USB Mini-b (5-pin)

A simple USB DAC

Home / Digital Audio / Digital-to-Analog Converters

Get Free Shipping on Orders Over \$35*

Cambridge Audio DacMagic XS Digital to Analog Converter

Item # CADMXS

★★★★★ (1)

[Review This Product](#)



Size/Color

Black \$74.99 - In Stock

**Order now and we'll process
your shipment the next
business day!**

Can ONLY be shipped to US Addresses

Regular Price \$129.00

Our Price: \$74.99

You Save: \$54.01 (42%)

Qty 1

[Add to Cart](#)

[Add To Wishlist](#)

\$75

A USB DAC (with headphone amp)



\$350

A USB DAC (with network renderer)

Home / Digital Audio / Digital-to-Analog Converters

AURALiC ALTAIR DAC and Streamer

Item # ACALTAIR

Get Free Shipping on Orders Over \$35*

★★★★★ (0)

[Review This Product](#)



Size/Color

Silver \$1,899.00 - In Stock

Our Price: \$1,899.00

**Order now and we'll process
your shipment the next
business day!**

Can ONLY be shipped to US Addresses

Qty 1

[Add to Cart](#)

[Add To Wishlist](#)

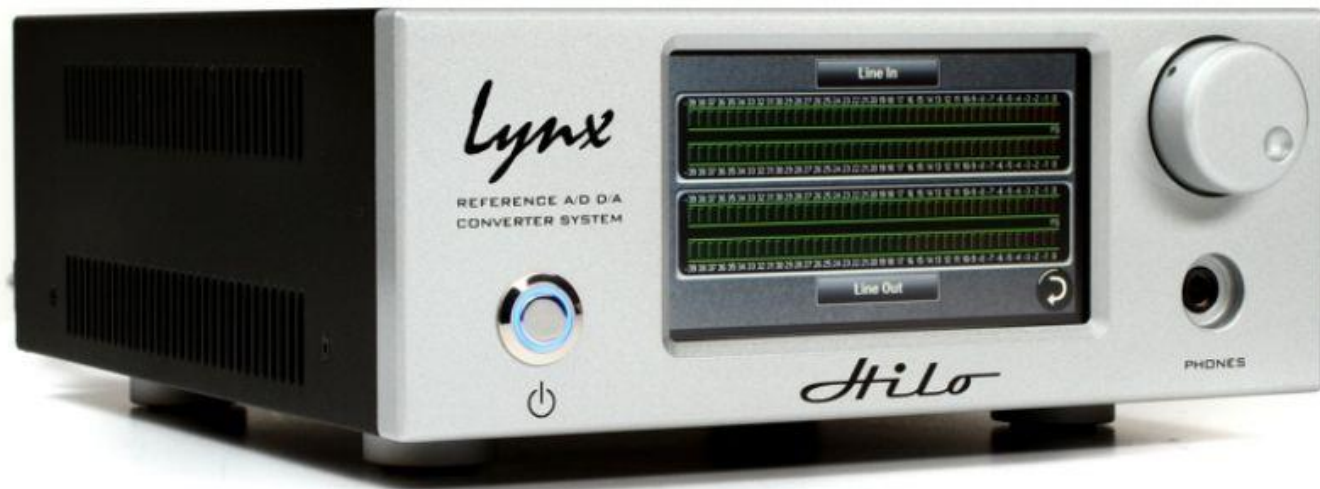
\$1900

A USB DAC (with phono + hp amp)



\$1995

A USB DAC (with ADC + hp amp)



\$1850 - \$2300

A USB DAC

(with net, hp amp, “vinyl emulation,” & other DSP)

DAC501 / DAC502 dsp d/a converter and network renderer



\$8800 - \$9800

Choosing a USB DAC–

Consider sound and features **you** need

- Portability (USB power)?
- Volume control?
- Headphone amp?
- DSD or MQA decoding?
- Analog inputs?
- Network inputs (“streaming”)?
- Balanced outputs?
- ADC for recording?

Have a non-USB DAC?

Four approaches to consider

1. Use the DAC in your computer (n/r)

2. Try a basic USB DAC →



3. Try this (\$25)



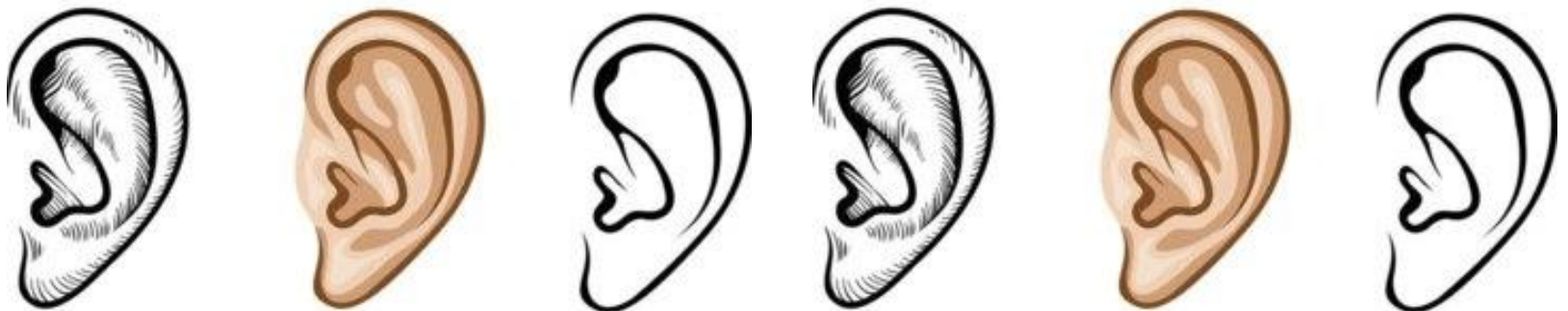
4. Or this:
(\$700-1000)



Choosing a USB DAC

Mike's take

- Great Redbook performance is **key**.
 - Hi Res, probably second
 - DSD – far less common
 - MQA – still being debated
- DACs have improved recently.
- They **do** sound different.
- **Try** before you **buy**.



Disk storage possibilities

- The disk in your computer
- A digital server w/ built-in disk
- An external (USB) drive
- Network-attached storage (NAS), preferably set up in RAID configuration to guard against some disk failures

Do you remember?

What other thing
is needed for USB
audio?

A Backup Strategy!

Every disk *will* fail.

**Back up your
files often!**



Simple USB setup #1



Any laptop, free player software

USB cable (\$0)

Audioengine A2+ powered speakers
with DAC (\$249)



Simple USB setup #2



Any computer
Free player software

USB thumb DAC
e.g., Dragonfly



Your headphones

Simple USB setup #3



USB-ish setup #4



Raspberry Pi running headless OS (e.g., Rune or Volumio)

Optional DAC card or digital output card



USB disk with music files

USB or
SPDIF
cable

or

Analog
interconnect
cables

**RPi controlled through any
device with a Web browser**

DAC



Preamp



Power
amp



Speakers

Your audio system

USB setup #5

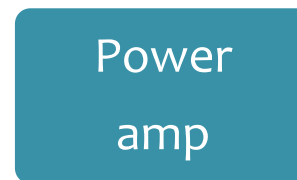
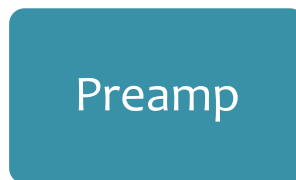
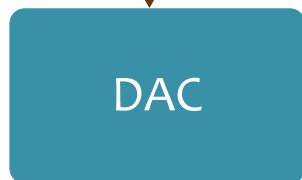


Any computer with
JRiver Media Center,
Roon, or free player

Network
attached
or USB drive
(optional)



USB cable



Full-featured audio system



USB AUDIO SOFTWARE: WHAT AND WHY

Why software?

- Ripping music from CD
- Cataloging your music
- Playing your music
- Maintaining your library
- Auxiliary functions
 - Writing CDs
 - Network server
 - File conversions
 - Volume control & EQ, DSP

Music file formats

- **Uncompressed PCM**
 - WAV
 - AIFF
- **Lossless compression**
 - FLAC
 - ALAC
- **Lossy compression**
 - MP3
 - AAC



Music file formats

- I recommend using a lossless compressed file format
 - FLAC unless you depend on Apple software
 - In that case, use ALAC
 - Performance is identical
- Some say uncompressed sounds better
 - Probably hardware-dependent
 - I don't hear it – decide for yourself
 - Uncompressed **may** handle tags less well

About tags (metadata)

- *Metadata*, usually stored in music files
- Artist, composer, genre, title, artwork,...
- Players are also database programs:
 - Tags = “fields” of the database.
 - Music cataloged by tags for search, etc.
 - Folder structure unimportant.
- **Good tagging helps you find what you want to play.**

Where do tags come from?

- **When ripping**, tags supplied by ripping program from public databases.
- **For downloads**, files come with some tags, but often need editing.
- **In Roon**, tags are supplied by Roon. Your tags can be used.
- **In Tidal**, files carry primitive and often erroneous tags.

JRiver (w/ tagging pane @ left)

File Edit View Player Tools Help

Sunny Murray: Short and Sweet (A Sanctuary Within) [44.1/16]
30% (-35.0 dB) — 0:01 / 6:37 — 1 of 9 for Lynx Hilo (full-range)

Search

Tag

Album: A Sanctuary Within
Album Artist: David Murray
Artist: David Murray
Bit Depth: 16
Catalog #: Black Saint 120145
Chorus:
Comment:
Composer: [Varies]
Conductor:
Date: 1991
Date Imported: 7/8/2017 7:23 pm
Disc #: 1
Genre: Jazz
ImportWeek: 201727
Instrument:
Keywords:
Label: Black Saint
Lyrics:
Name: [Varies]
AllMusic Review by AllMusic [-]
Notes: A SANCTUARY WITHIN packs some surprises. For one, hearing David Murray ...
Number Plays: [Varies]
Orchestra:
People: David Murray (ts, bass cl)
Sunny Murray (d)
Kahil El'Zabar (pc)
Tony Overwater (b)
Rating: ? stars
Sample Rate: 44100 Hz
Soloists:
Subgenre: Quartet
Track #: [Varies]
Year: 1991

Lynx Hilo (full-range)

Track: Short and Sweet
Alb. Artist: David Murray
Album: A Sanctuary Within
Composer: Sunny Murray
Year: 1991
Genre: Jazz
People: David Murray (ts, bass cl); Sunny Murray (d); Kahil El'Zabar (pc); Tony Overwater (b)

Comments:

Lin...	Wy...	Cze...	Jaz...	5	6	7	AV...	WU...	KUHF	Lin...	Wyo C
...	↑	Dur...	Def	D...	Tr...	Name					
1		6:37	44/16	1	1	Short and Sweet					
2		6:21	44/16	1	2	Mountain Song					
3		10:16	44/16	1	3	Return of the Lost Tribe					
4		5:33	44/16	1	4	Waltz to Heaven					
5		6:08	44/16	1	5	A Sanctuary Within - Part I (Duo)					
6		9:00	44/16	1	6	A Sanctuary Within - Part II (Quartet)					
7		8:54	44/16	1	7	Most of All					
8		7:13	44/16	1	8	Song for New South Africa					
9		10:40	44/16	1	9	Ballad for the Blackman					

Albums

MHP Panes

Educational

Prokofiev – Symphony No.6
Titov/New Philharmonia
Prokofiev, Sergey (1891-1953)

Back in Prokofiev's USSR
Lan Shui/Singapore SO
Prokofiev, Sergey (1891-1953)

Debussy: Jeux (ballet music)
Lan Shui/Singapore SO
Debussy, Claude (1862-1918)

Pickard: The Flight of Icarus, etc.
Brabbins/Norrköpping SO
Pickard, John (1963-)

A Sanctuary Within
David Murray
Jazz : Quartet : 1991

Special Quartet
David Murray
Jazz : Quartet : 1991

Brand New Bag
Ebony Brass Quintet
Jazz : Quintet : 1995

Les Liaisons Dangereuses 1960
Thelonious Monk
Jazz : Quintet : 2017

Cantatas, v.05 (BWV 18, 143, 152,...
Suzuki/Bach Collegium Japan
Bach, Johann Sebastian (1685-17...

9 Files (372 MB - 1:10:44)

A tag editor (mp3tag)

Mp3tag v2.82 - \\diskstation\Music\JazzPop\Ali Akbar Khan\Indian Architecture\

File Edit View Convert Actions Tag Sources Tools Help

Title: < keep >

Artist: Ali Akbar Khan

Album: Indian Architecture

Year: 2001 Track: < keep > Genre: International

Comment:

Directory: \\diskstation\Music\JazzPop\Ali Akbar Khan\Indian Architecture\

Album Artist: Ali Akbar Khan

Artist URL:

Composer: < keep >

Discnumber: < keep >

Subgenre: Indian

image/jpeg
1100x1100
149 KB
Front Cover

Discnu...	Track	Title	Composer	Filename
1	1	Rag Alam Bhairav	Ali Akbar Khan	1-01 Rag Alam Bhairav.flac
2	2	Rag Durga		2-02 Rag Durga.flac
1	2	Rag Hemant	Ali Akbar Khan	1-02 Rag Hemant.flac
2	1	Rag Megh-Sarang		2-01 Rag Megh-Sarang.flac

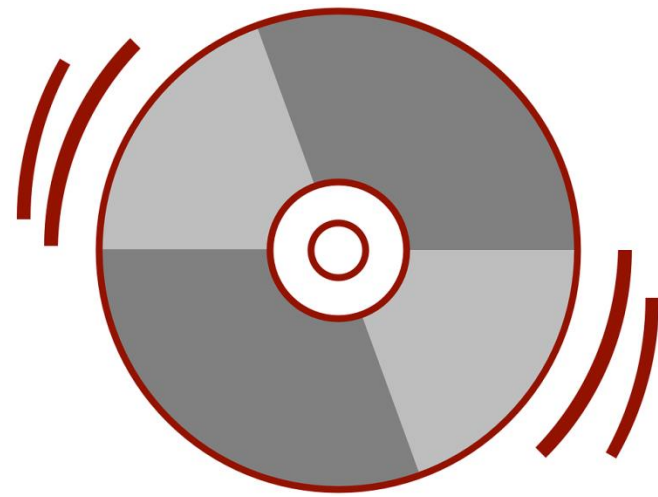
Filter:

Ready

4 (01:52:16 | 428.9MB) 4 (01:52:16 | 428.9MB)

Ripping steps

- Open ripping software.
- Insert disc.
- Choose highest error correction level.
- Inspect/edit metadata.
- Choose file format & location.
- Press “Rip disc.”
- ± Tell your player program to rescan.



Which ripping software?

Mike's take

- **Ripping 1000s of CDs is a lot of work**
- So pay a little for software that is
 - Quick
 - Flexible
 - Accurate
 - Offers best metadata
- **Get dBpoweramp reference (\$39).**
 - And set it up for most accurate ripping.



Adding downloads to your music library



- Download and unZIP.
- Copy files to your music folder tree.
- ± Inspect & edit metadata.
- ± Tell your player program to rescan.

Using Tidal



- Sign up and pay.
- *If using Roon, it will virtually meld Tidal into your library.*
- *Otherwise, use the Tidal application for your device.*

Tidal & Roon

Roon

≡ <

VOL 17

hansler CLASSIC

Carl Philipp Emanuel Bach
THE COMPLETE WORKS
FOR PIANO SOLO
Ana-Marija Markovina

Wq 62 [II]

1 hr, 18 min

C.P.E. Bach: The Complete Works for Piano Solo, Vol. 17
Ana-Marija Markovina

▶ Play Album + Add To Library ⋮

Released
29 Apr 2014

★★★★★

Tracks Credits

1	I. Allegretto	4:27	▶ 1	⋮
2	II. Adagio	2:21	▶ 1	⋮
3	III. Presto	2:35	▶ 1	⋮
4	I. Allegretto	3:44	▶ 1	⋮
5	II. Andante	2:25	▶ 1	⋮

I. Allemande
Ana-Marija Markovina

0:38 3:01

Lynx Hilo (ASIO) -24dB

Why a player program?

- Selects & plays music; controls volume
- Catalogs music (database)
- May also provide –
 - Tag editing
 - Format conversion
 - CD burning
 - DSP (EQ, crossovers, room correction)
 - Network server(s)
 - Remote control apps

Two good players compared

Both do macOS, Windows, Linux

Feature	JRiver Media Center	Roon
Local, network playing	Yes	Yes, same GUI
Ripping	Good	None
DACs supported	All	Roon-ready
Cost	\$50 – \$70, depending on how many OS	\$120 annual \$500 perpetual
Update cost	Free for 12 months	Free with license
Installs allowed	Unlimited	Core on 1 CPU
Integration with Tidal	No	Yes
GUI	Customizable	Idiosyncratic, fixed
Tagging	Tag as you wish	Little or no need
Tag editing	Outstanding, easy	Passable
Liner notes	<i>Links to internet</i>	<i>Includes info</i>

Choosing a player

- JRiver
 - Your music library is neat & tidy
 - You want to tweak your experience
 - You have a DAC not supported by Roon
- Roon
 - You can't be bothered with fixing tags
 - Simplicity, not flexibility, is key
 - Your DAC is supported by Roon
 - You want Tidal integrated with your library
- MusiChi
 - Your library is classical music
 - You want consistent, automatic tagging

A word about iTunes

Mike's take



- The most-used audio program
- Has most functions needed, but...
 - Slow, can't be customized
 - Inaccurate ripping
 - No FLAC support
 - May convert sample rates arbitrarily
 - Editing tags is tedious
- **At least *evaluate* other programs.**

USB vs. Network

- No need to choose.
- Start with USB, add networking later
- Same files, tagging, storage needs, and backup systems for both
- **In Part 2, I'll cover networked audio.**



HOW I'VE DONE IT (TWO SYSTEMS)

Desktop system



NAS



Router



Basement system



Tablet with control app



Renderer

USB



Preamp



Power amp



Speakers

Concluding thoughts (1/2)

Choosing a system

- Manufacturer don't keep promises.
 - Does hardware meet your needs **now**?
 - Is software available for your preferred platform **now**?
- Choosing a configuration
 - Discs make noise.
 - Try to avoid mixing mechanical w/ \$\$\$ elx.

Concluding thoughts (2/2)

- Computer audio can (at least) equal the fidelity of optical discs.
- USB audio is a great way to start.
 - Home networking adds features.
- Choices of hardware and software depend on **your** budget & priorities.
 - SW: in many cases, a few bucks buys a lot.
 - Roon offers more and costs more.



**THE END.
THANK YOU.**