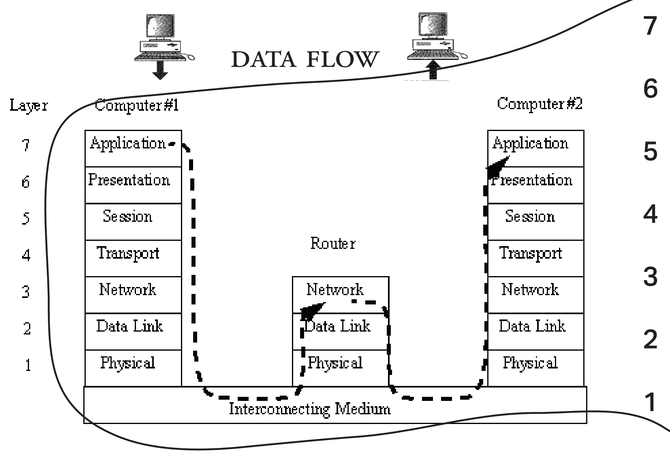
Fiber-glass-noodle Internet

Edible low speed network cable based on glass noodles. Leveraging the mediums properties for both data transportation as well as culinary delight.

Introducing the highly impractical medium of glass noodles into the 'network stack' allows one to reflect on the advantages and limitations of networking standards set by bodies like the International Organization for Standardization.

Below you find a rough exposition of the communication standard set by the ISO, its implications and how glass noodle internet fits in there, as well as schematics and pcb-masks to build you own fiber glass noodle connection.

The ISO OSI Model



The International Standards Organization (ISO) Open Systems Interconnection (OSI) model is a conceptual model developed in the late 1970's that standardizes the communication functions of a telecommunication or computing system without regard to their underlying internal structure and technology. [1]

Its goal is the interoperability of diverse communication systems with standard protocols or conventions on both the hardware and the software level.

The original model divides a communication system into seven abstract layers. This offers interoperability of different concrete implementations; as long as the protocols are respected, it doesn't matter if your internet is delivered through a (copper) wire or through the air (wifi) (layers 0,1,2), your applications (layer 7) will work the same. But the abstraction also, deliberately, de-politicizes (see layer 10).

Just as 'ethernet' implies the medium being neutral to its message, the cloud analogy depoliticizes, dematerializes and therefore obfuscate the power dynamics it inherently facilitates.

Of course, 'ether' does not exist, just like media nor technology is neutral.

In addition to the seven layers defined in the OSI model (see right), computer security specialist and writer Bruce Schneier proposes an additional three layers to the model [2].

See also the TCP/IP model for a more pragmatic approach to computer networking.

1).https://en.wikipedia.org/wiki/OSI_model, retrieved Aug. 2016.

2).https://en.wikipedia.org/wiki/Layer_8, retrieved Aug. 2016

Layer 10: Government.

The internet literally traverses national boundaries. Nation states can and will serve you the internet in a way that is in their best interest. The OSI model deliberately de-politicizes the network stack by not including a governmental layer in the model

and therefore facilitates oppression, censorship and balkanization of the internet. There is no internet.

Layer10

Layer 9: The organization.

Organization running the network infrastructure like Internet Service Providers, or ISP's. But possibly also NGO's like the ISO. Layer 9 takes into account the very thing that developed the model it is part of.

Layer 9

Layer 8: The individual person. the user

The meat space layer. Takes the human factor of the network into account. Errors in this layer are commonly referred to as PICNIC. "Problem In Chair, Not In Computer." Susceptible to social engineering.

Layer 8

email ftp www dns encoding decription .doc .jpg decoding encryption SOCKS authenthication

7 application sessions

6 presentation rpc authorization

5 session

4 transport tcp ssl tls udp

3 network icmp ipv4 ipv6

2 data link

1 physical RJ45 modulation negotiation 100base TX IEEE802.15.7 802.11 *dsl ethernet MAC AX.25 arp 802.11

Layer 0

Layer 0: Interconnecting Medium

The Physical Layer is limited to the processes needed to place the communication signals over the media, and to receive signals coming from that media. The lower boundary of the physical layer of the Open Systems Interconnection (OSI) model limits itself to the physical shape of the connector attached to the transmission media. The actual physical medium the signal travels through remains outside of the scope of the OSI model and is represented by layer 0.
Typically the medium consists of copper (wire), fiberglass (light) or air (wifi, sound, light). And in this case potato starch-based noodles, or glass noodles.

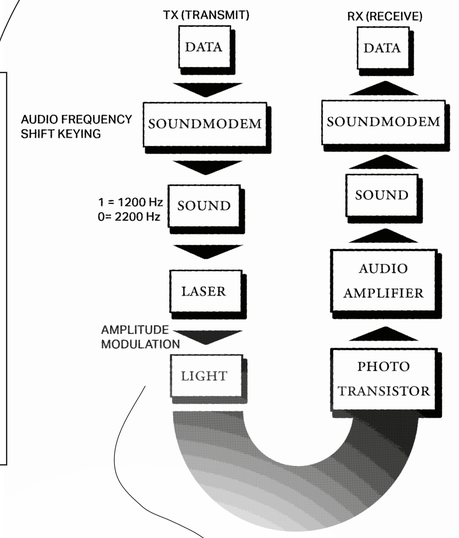
In addition to the OSI networking standard, the noodles used in the network stack are compliant with the ISO 9001 'guidelines for the food and drink industry'

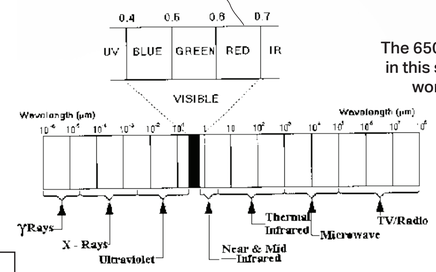
While "ISO 9001 focuses on customers' needs and expectations" [8] its effectiveness is highly criticized.
The ISO certification on noodles is claimed to primarily be a bureaucratic, post-Fordist [7], control system (audits through checklists) that possibly results in oppressive manufacturing regimes rather than actually improving the overall quality of the produce nor working conditions and customer care [9].

7).Dikmen, ahmet, Aplay, NEW ECONOMIC ORDER: POST FORDISM, nisan 1998
8). http://www.iso.org/iso/home/news_index-/news_archive/news.htm?refid=Ref807, retrieved Aug. 22, 2016
9). https://en.wikipedia.org/wiki/ISO_9000#Criticisms_of_ISO_9000, retrieved Aug. 22, 2016

Schematics & Software

BLOCK DIAGRAM



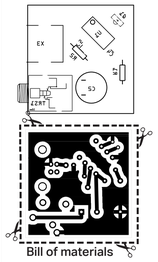


The 650nm red laser used in this setup is part of the worldwide unlicensed radio spectrum

EM SPECTRUM

SCHEMATICS & PCBS

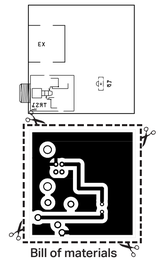
Receiver



Bill of materials

C2: 250µF Elco
C4: 0,33µF
C5: 0,33µF
Q1: Photo Transistor
R1: 10Ω Resistor
R2: 10Ω Resistor
TRS1: Audio Jack (TRS) 3.5mm, package PG203J
U1: LM386 Opamp, DIP package
X3: USB-B, package usb-b-pth

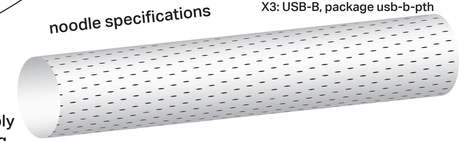
Transmitter



Bill of materials

Q1: Laser Diode
TRS1: Audio Jack (TRS) 3.5mm package PG203J [THT]
X3: USB-B, package usb-b-pth

noodle specifications



Complies with the following standards:

ISO9001
HACCP (hazard analysis and critical control point)
JP-262
(EC) No 669/2009 annex I
(EU) No 187/2011
(EU) No 618/2013 annex I

Six minute cooking time.

SOFTWARE & SETUP

In this setup we use existing software to transmit data over sound and custom hardware to convert that sound into (modulated) light (type alert!*).
To transmit data over sound we need a 'modem' that 'modulates' data into sound and on the receiving end 'demodulates' the sound into data. Today we can use software to this. Take a look at for example Minimodem, Soundmodem or Direwolf.

On the hardware side we mix the resulting audio (electrical current) with the power supply of the laser to 'amplitude modulate' the light. This is done with the hardware outlined above. The light is received and converted to an electrical current by the photo-transistor and fed into an audio amplifier.

*see also: Visible Light Communication, IEEE802.15.7

disclaimer: the osi model description is an approximation and far from complete. Subject to misprints, errors and technical modifications. In addition to the soft- and hard-ware oulined above you need: 2x computer with soundcard, 2x mini jack to mini jack cables, 2x USB-A to USB-B Cables.