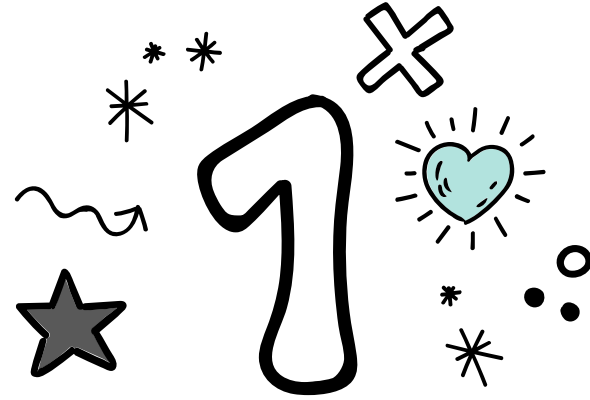


Optical Fiber Networks

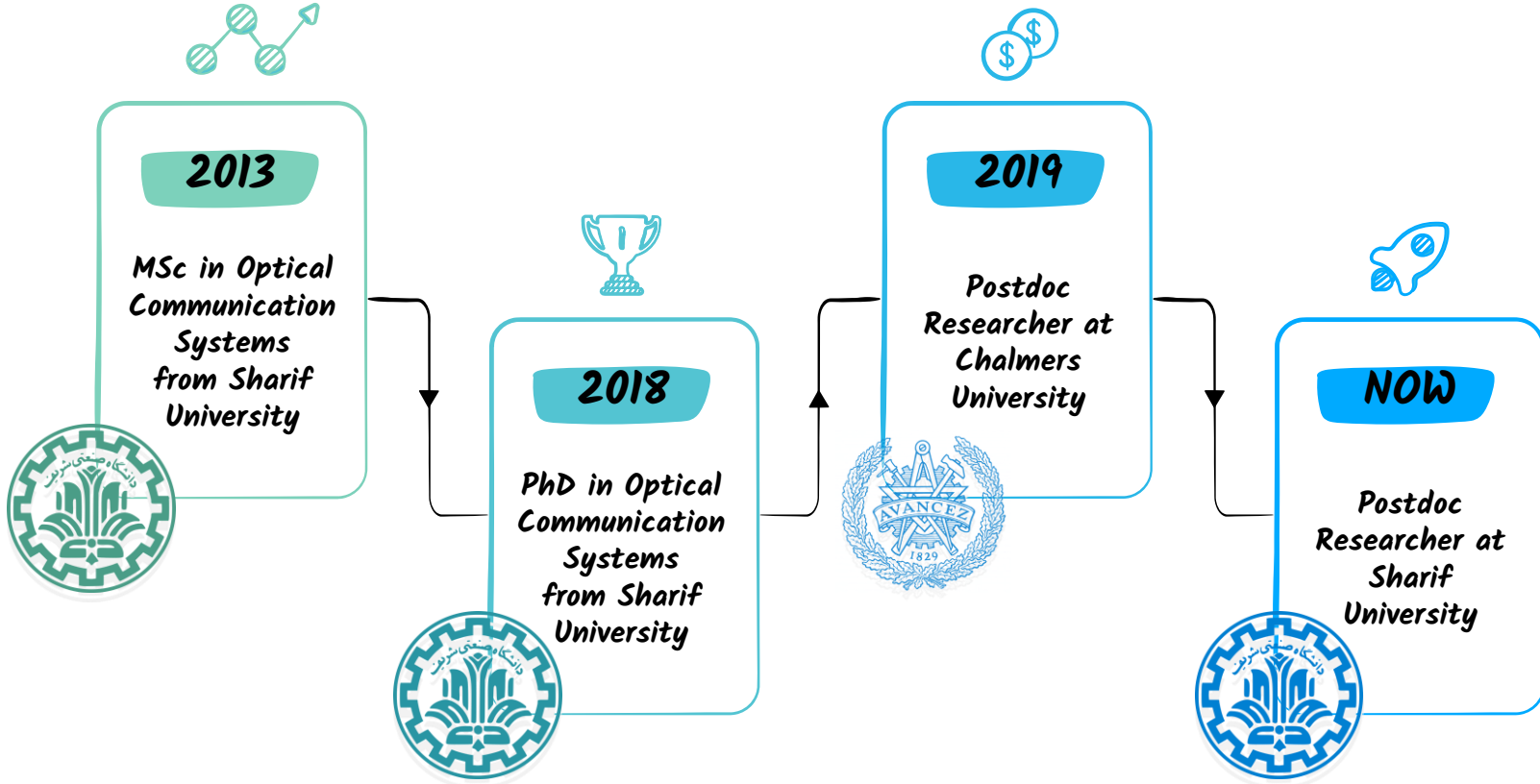
*Mohammad Hadi
Sharif University of Technology*





Biography

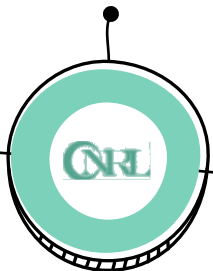
Recent Academic Positions



Recent Industrial Collaborations

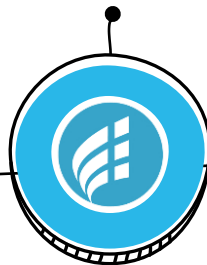
DNRL/ONRL

Data/Optical
Networks Research
Lab



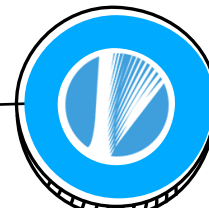
TIC

Telecommunication
Infrastructure
Company



ITRC

Iran
Telecommunication
Research Center




FORCE

Fiber Optic
Research Center

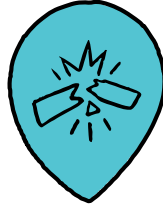
Recent Achievements



IUT/BMN



*MSc/PhD
Scholarship*



IEEE



*Outstanding
PhD Thesis*



SHUT



*Outstanding
PhD
Researcher*



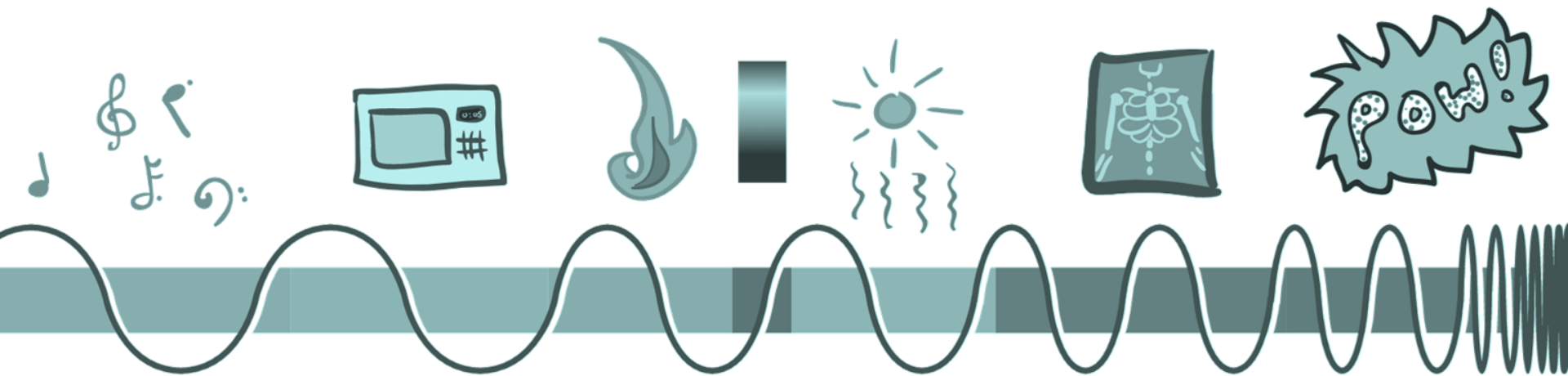
FORCE/BMN



*Research
Funding*



Introduction



Radio

long wavelengths that are used for radio stations

Microwaves

Cooks snacks!

Infrared

Makes up heat

Visible Light

All the colors of the rainbow - what we see

Ultraviolet

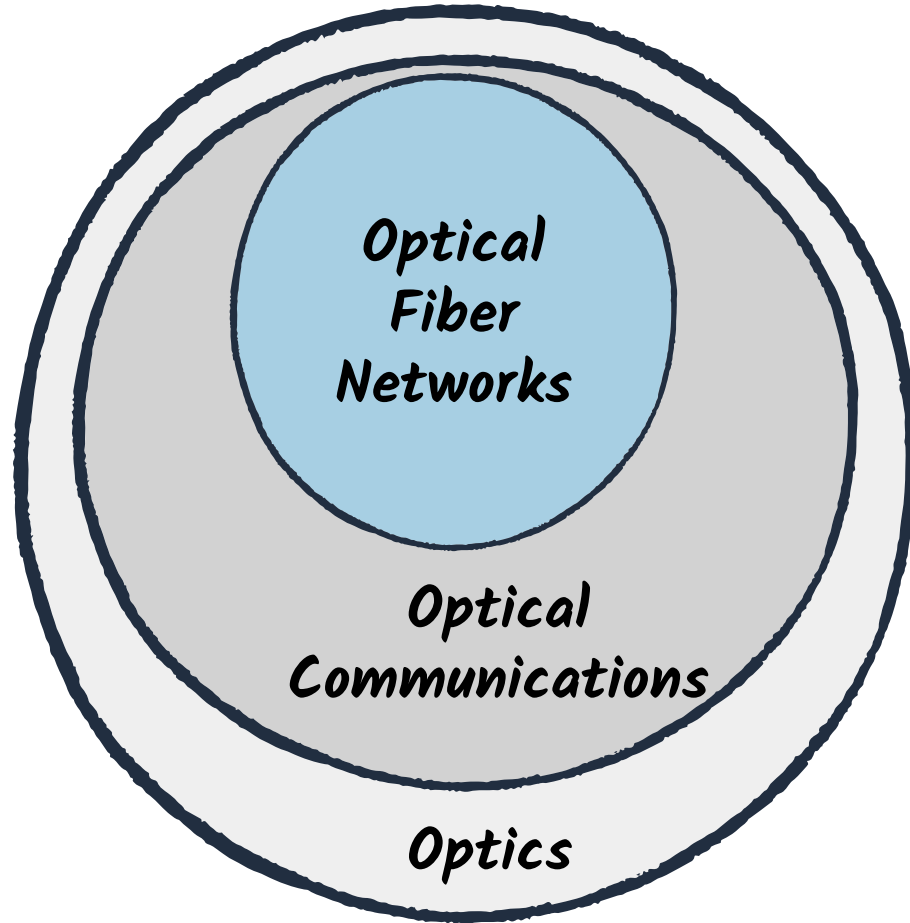
Responsible for sunburns ☹️


X-Ray

Takes pictures of your bones!

Gamma Ray

Part of many superheros' origin stories - like the Incredible Hulk!



Strange Quantities 


1


2

Supporting Entities 

3

4

 *Knowledge Diversity*

 *Real Applicability*

Strange Quantities



TeleGeography Submarine Cable Map

The Submarine Cable Map is a free and regularly updated resource from TeleGeography.

Got a question about how we make this map? Or about how submarine cables work? [Look no further.](#)

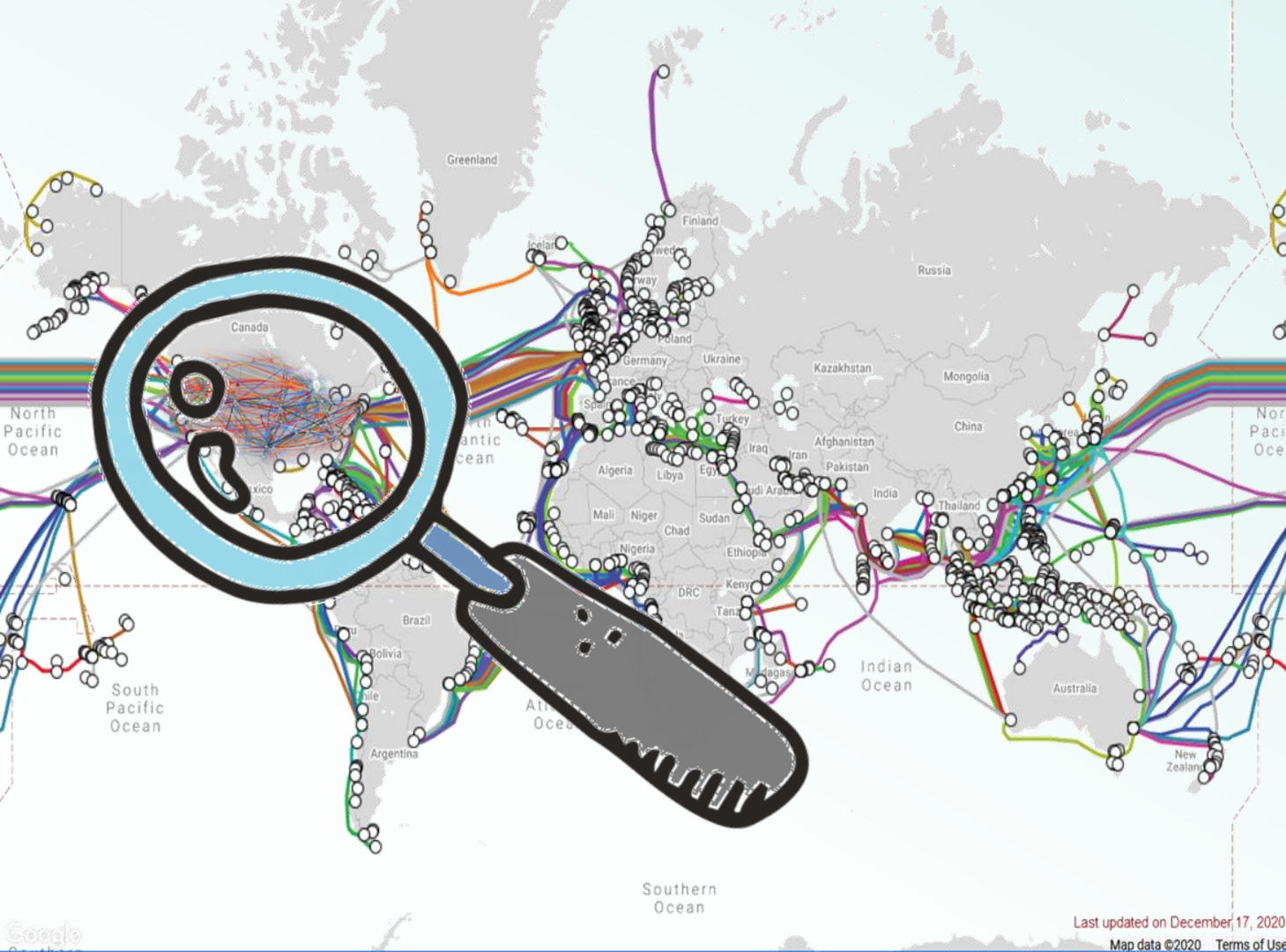


Sponsored in part by HMN Technologies [Feedback](#) [t](#) [f](#) [github](#)

Submarine Cables

- 2Africa
- ACS Alaska-Oregon Network (AKORN)
- Aden-Djibouti
- Adria-1
- AEConnect-1
- Africa Coast to Europe (ACE)
- Alaska United East (AU-East)
- Alaska United Southeast (AU-SE)
- Alaska United Turnagain Arm (AUTA)
- Alaska United West (AU-West)
- ALBA-1
- Aletar
- Alonso de Ojeda
- ALPAL-2
- America Movil Submarine Cable System-1 (AMX-1)
- Americas-I North
- Americas-II
- Americo Vespucci

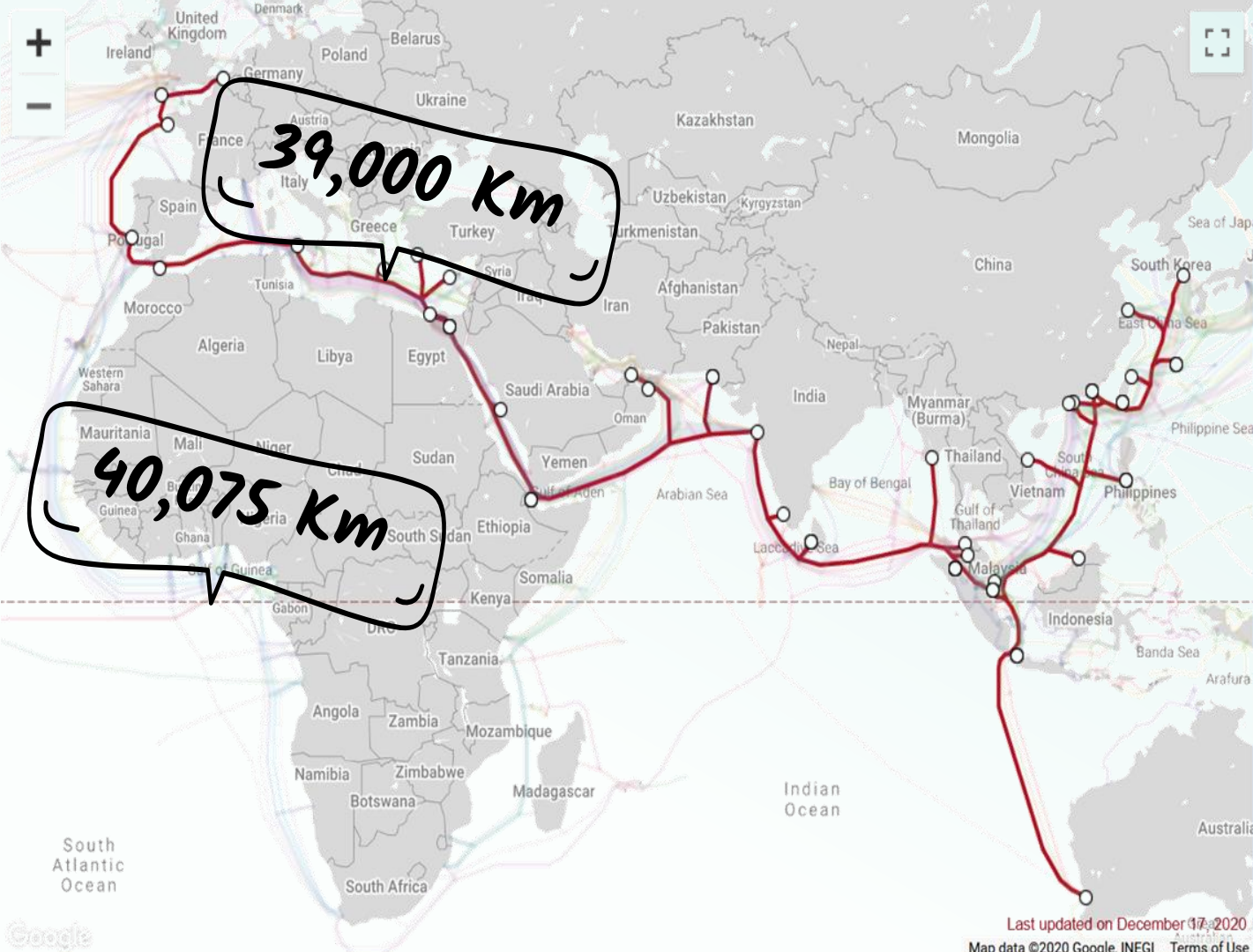
All content © 2020 PriMetrica, Inc.



Last updated on December 17, 2020

Map data ©2020 [Terms of Use](#)





39,000 Km

40,075 Km

SeaMeWe-3

[Email link](#)

RFS: 1999 September

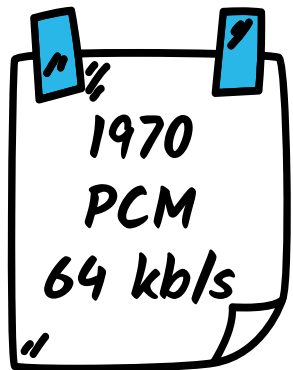
Cable Length: 39,000 km

Owners: Orange, BT, KDDI, Singtel, Telecom Italia Sparkle, Telekom Malaysia, OTEGLOBE, AT&T, BICS, CAT Telecom Public Company Limited, China Telecom, Deutsche Telekom, Etisalat, Telecom Egypt, CTM, Indosat Ooredoo, Jabatan Telecom Brunei, KT, Altice Portugal, Maroc Telecom, PLDT, Saudi Telecom, Sri Lanka Telecom, Turk Telekom, Tata Communications, Chunghwa Telecom, Verizon, KPN, Telekom Austria, Singtel Optus, Telstra, VNPT International, Omantel, PCCW, Pakistan Telecommunications Company Ltd., Cyta, eir, LG Uplus, Softbank Corp, Telkom South Africa, Rostelecom, Orange Polska, Singtel Optus, Telecom Argentina, Myanmar Post and Telecommunication (MPT), Vocus Communications, Djibouti Telecom, Embratel, Vodafone, Turk Telekom International, Ukrtelecom, Singtel Optus, Tunisia Telecom


URL: <http://www.seamewe3.net>

Landing Points

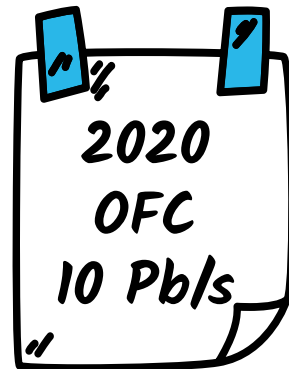
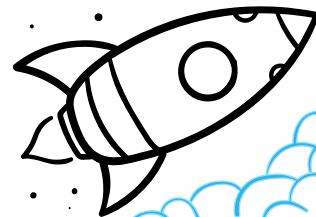
- Alexandria, Egypt
- Ancol, Indonesia
- Batangas, Philippines
- Chania, Greece
- Chongming, China
- Cochin, India
- Danang, Vietnam
- Deep Water Bay, China



1970
PCM
64 kb/s

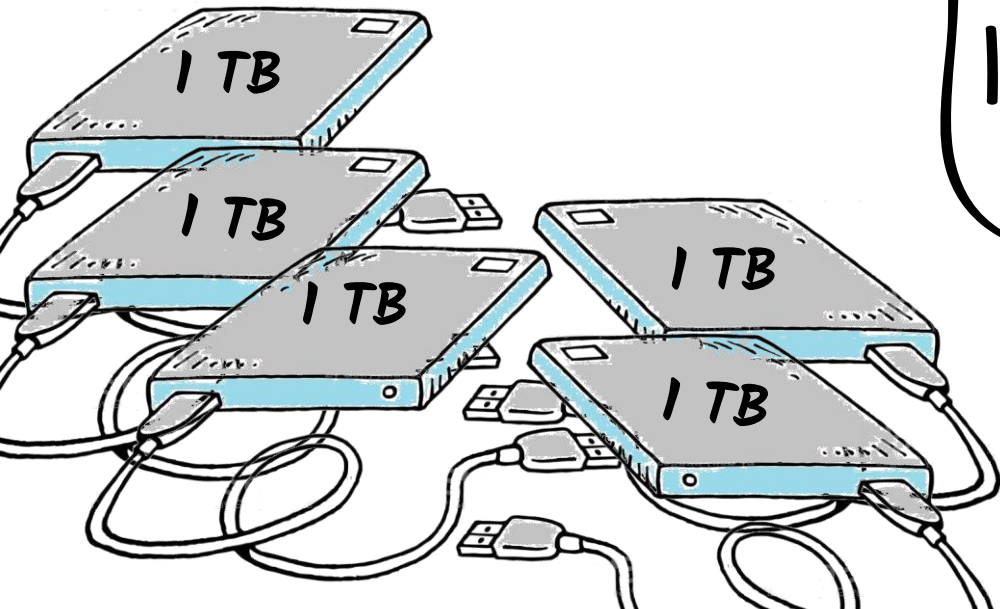


156,250,000,000

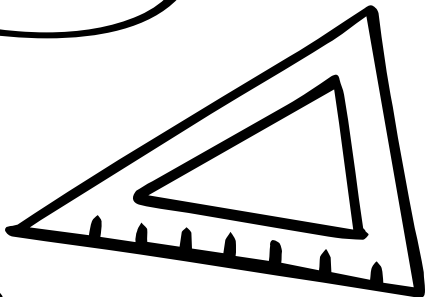
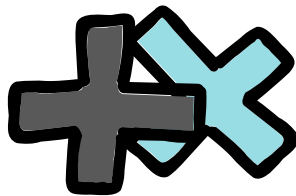
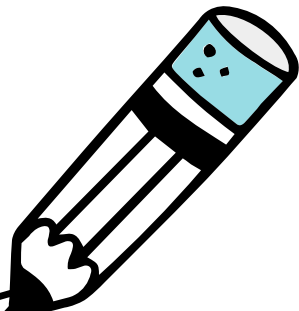


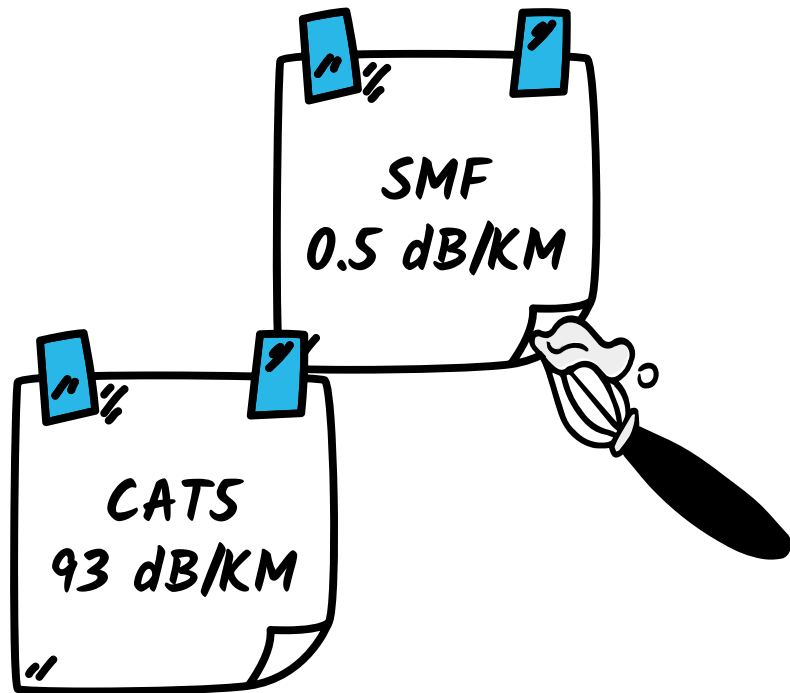
2020
OFC
10 Pb/s

2020
OFC
10 Pb/s



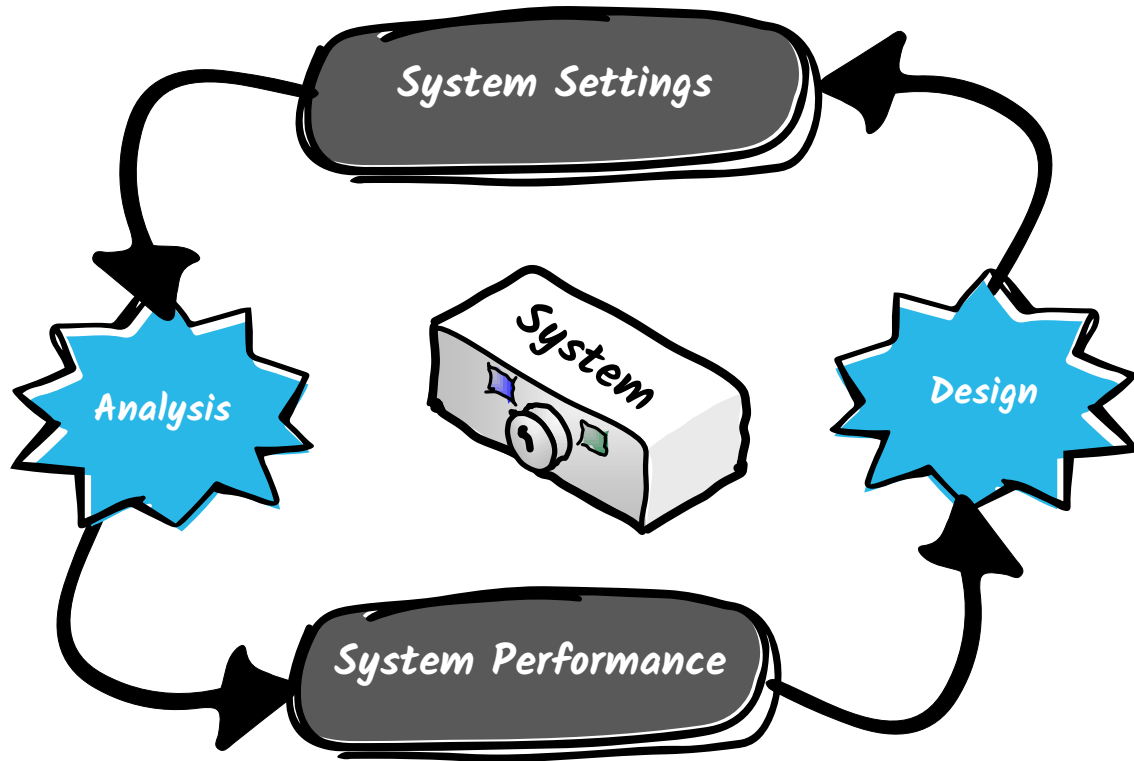
1137 H.D.Ds
Per second!!!





Knowledge Diversity





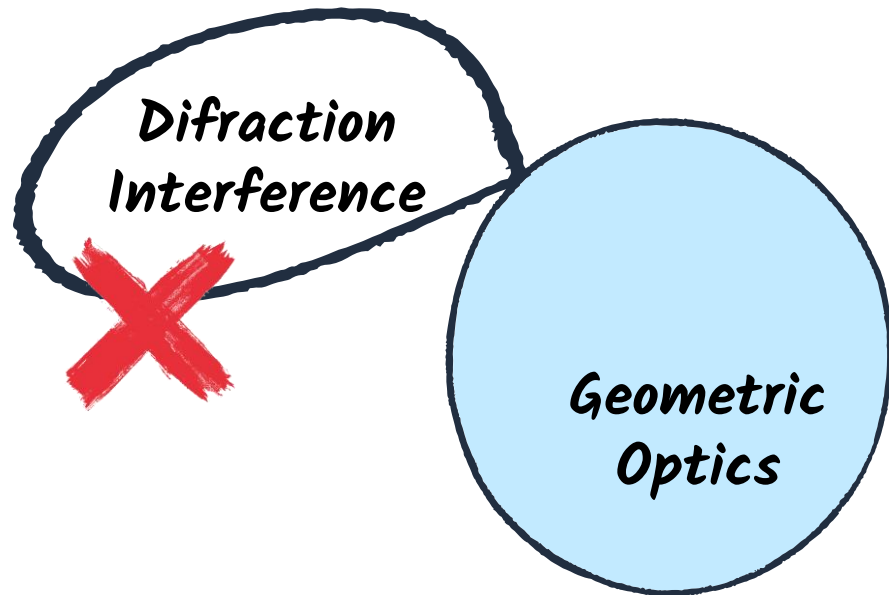
Note:

Design addresses implementation and Configuration!!!

Refraction
Reflection

A hand-drawn diagram consisting of two overlapping circles. The larger circle on the right is light blue and contains the text 'Geometric Optics'. The smaller circle on the left is white with a black outline and contains the text 'Refraction' and 'Reflection'. A green checkmark is drawn over the bottom-left corner of the smaller circle. A black line connects the two circles at their overlapping point.

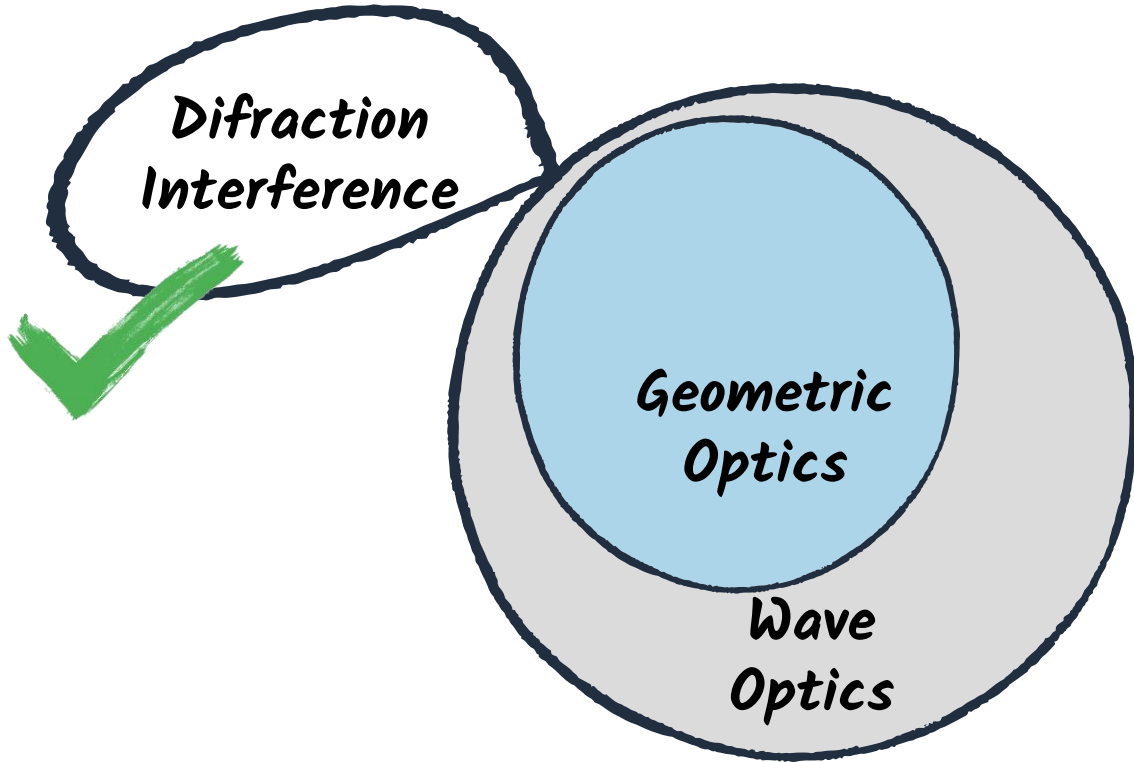
*Geometric
Optics*



Diffracion
Interference



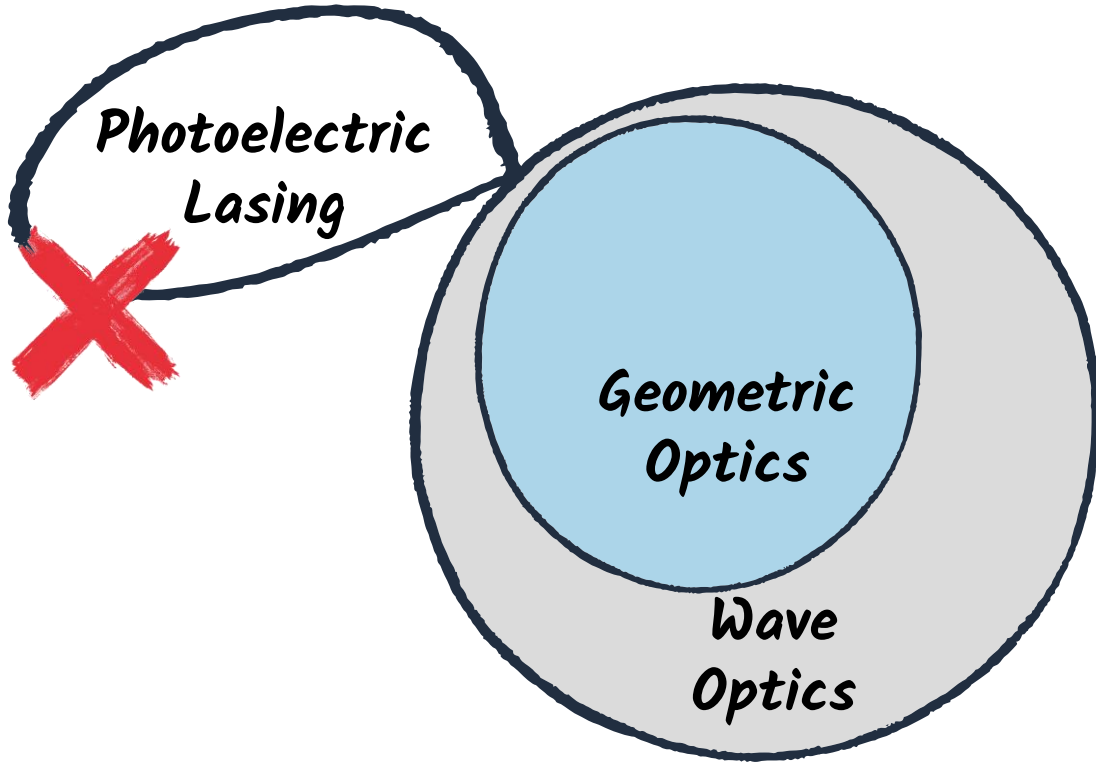
Geometric
Optics



Diffraction
Interference

Geometric
Optics

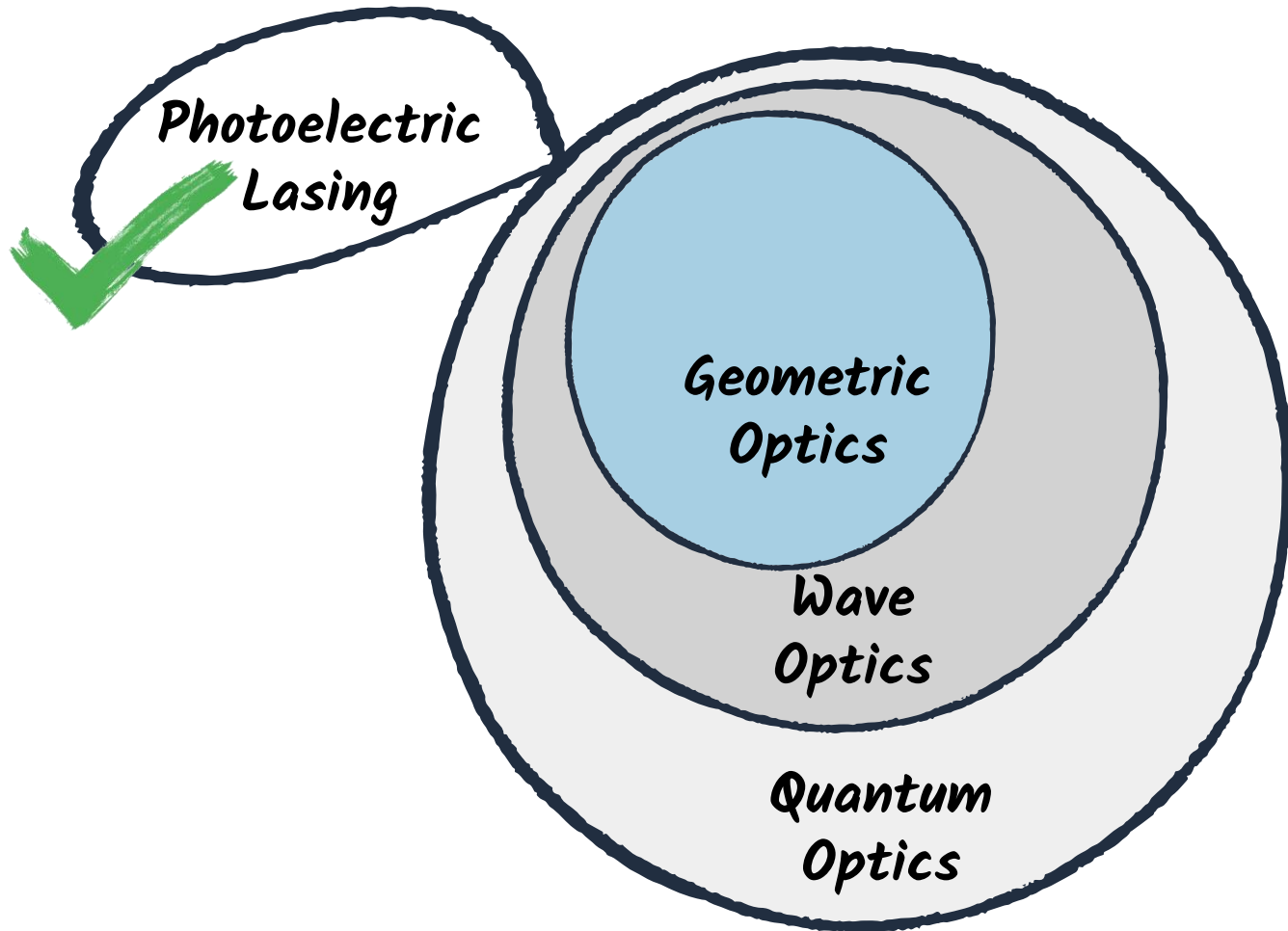
Wave
Optics

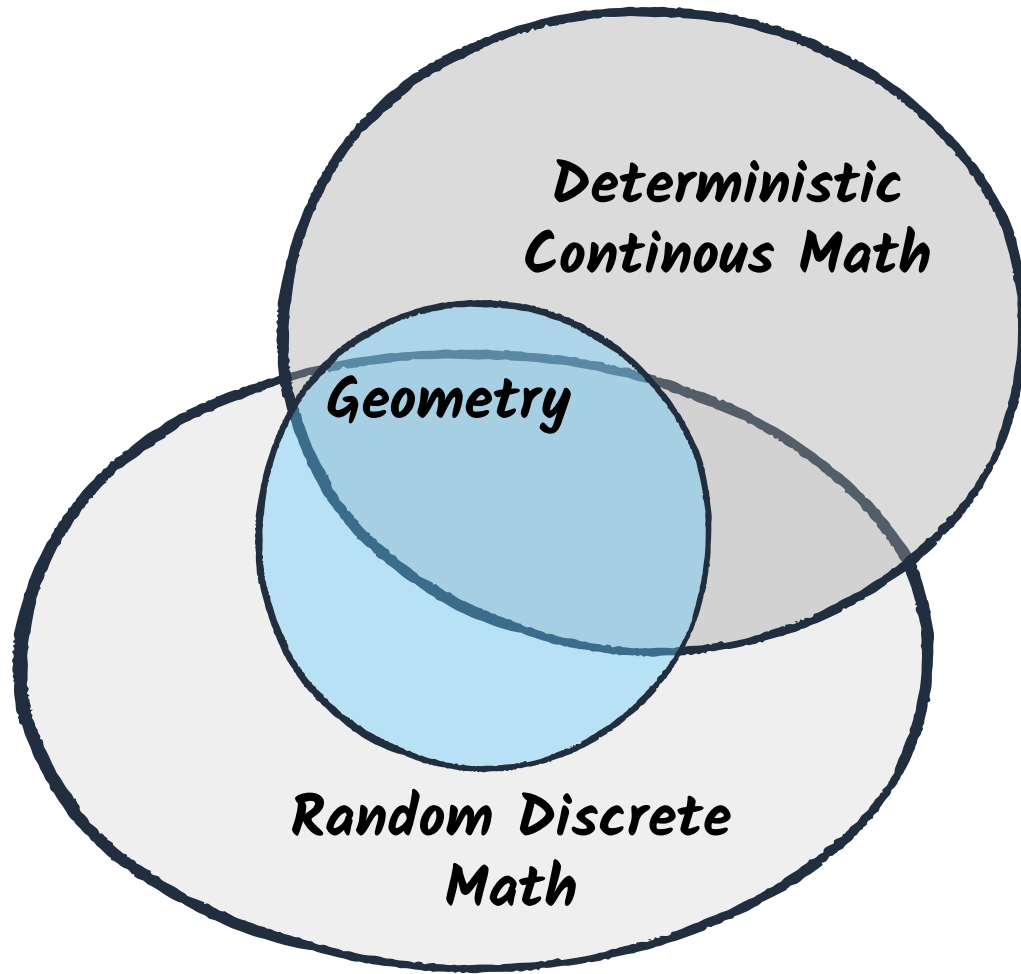


Photoelectric
Lasing

Geometric
Optics

Wave
Optics

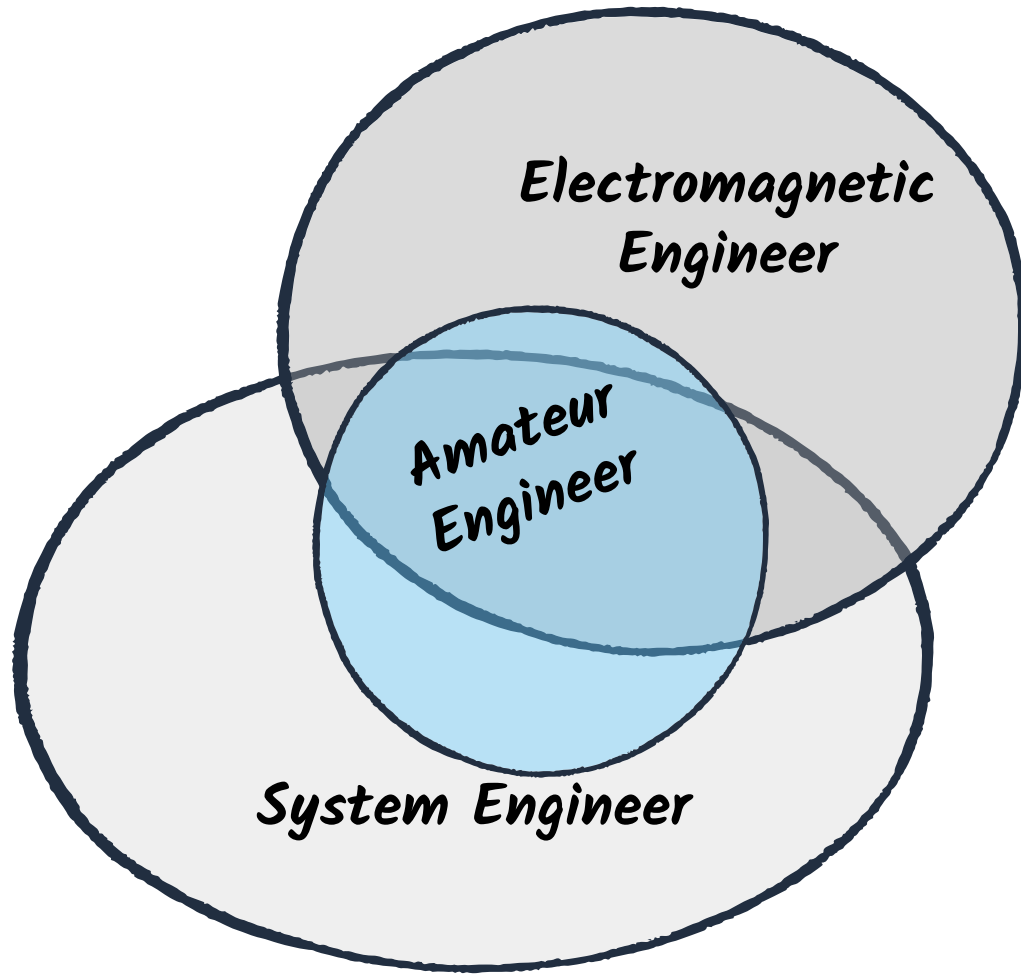


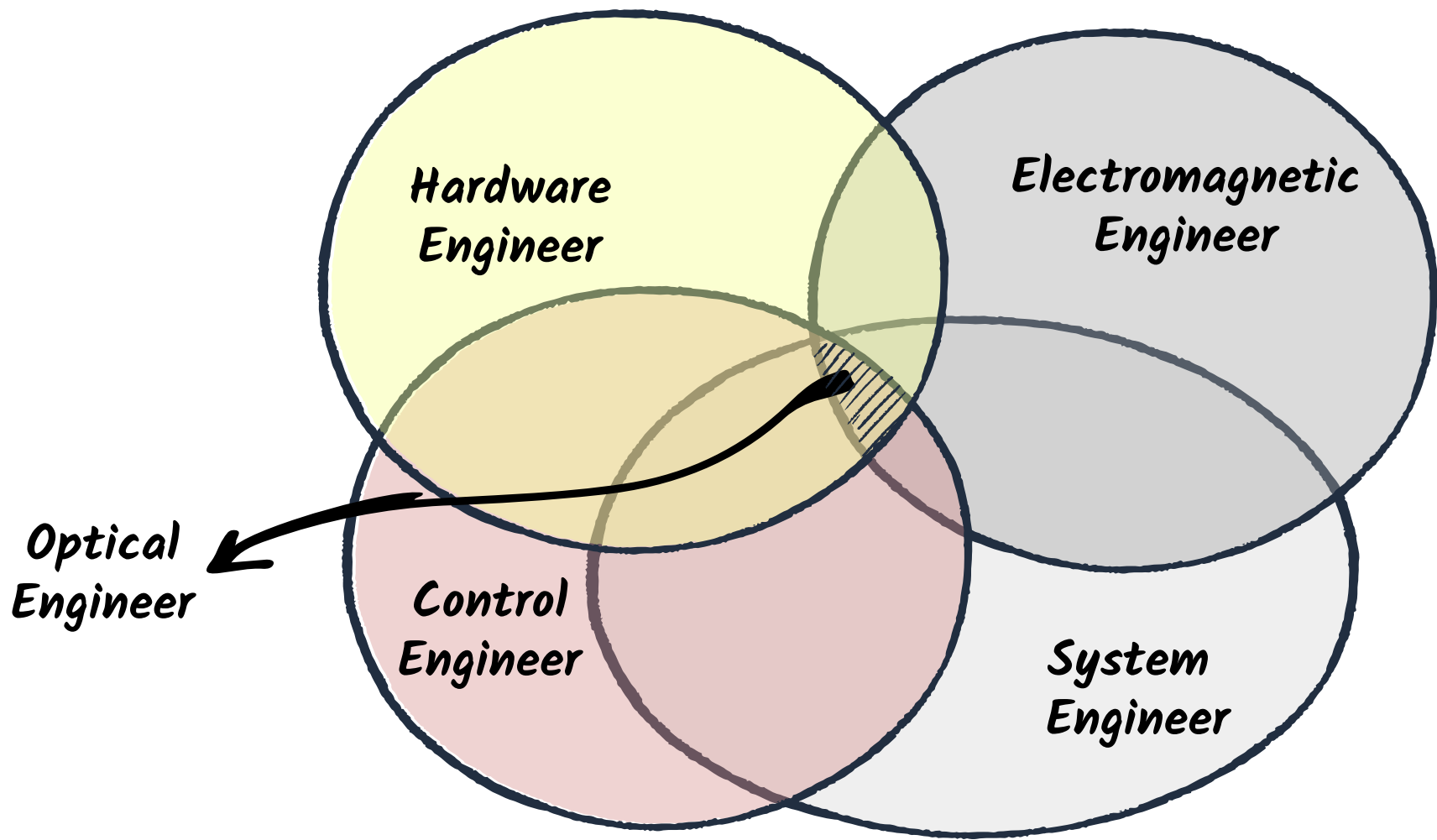


*Deterministic
Continuous Math*

Geometry

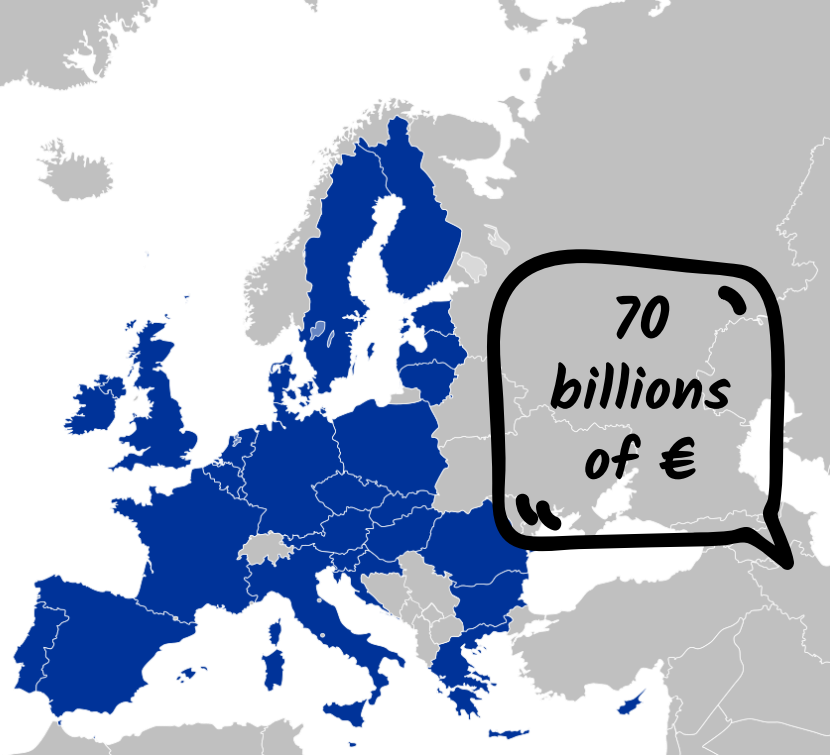
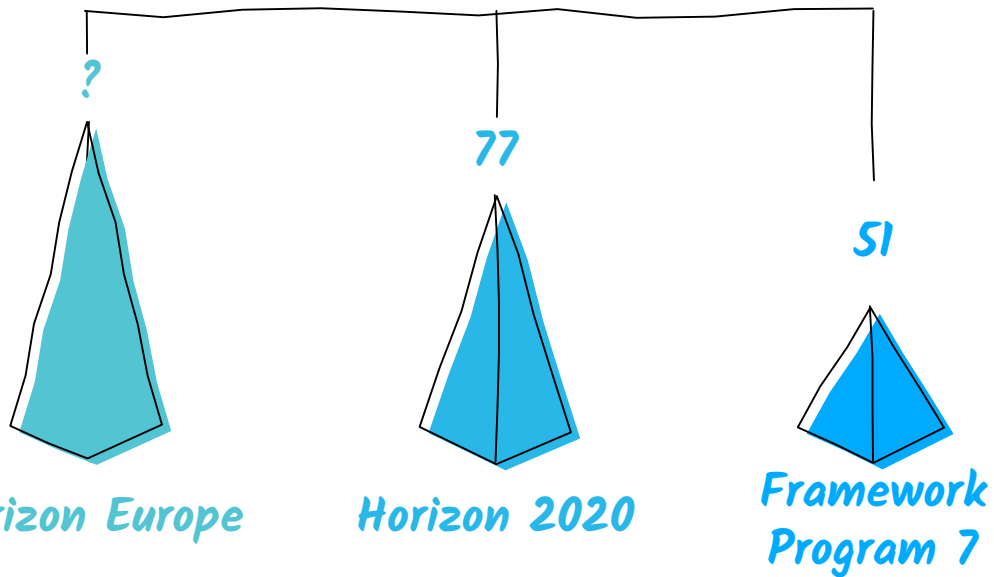
*Random Discrete
Math*



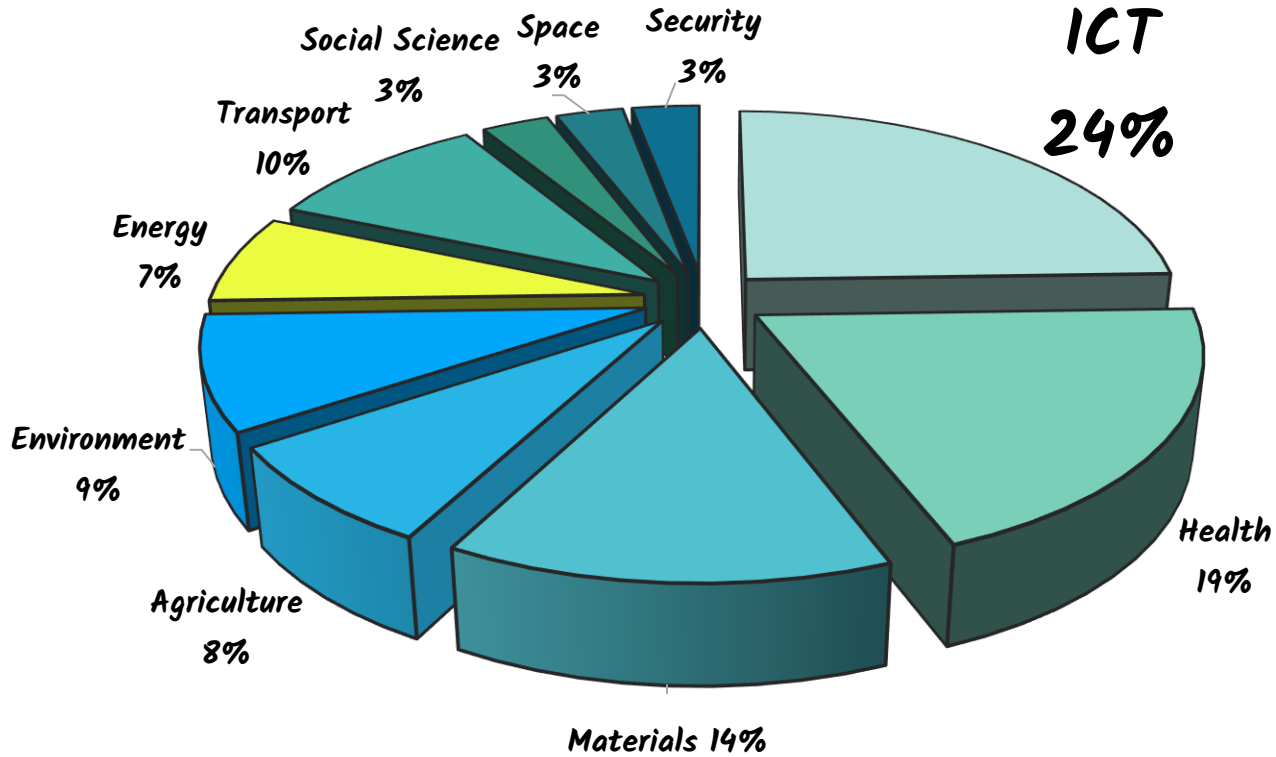




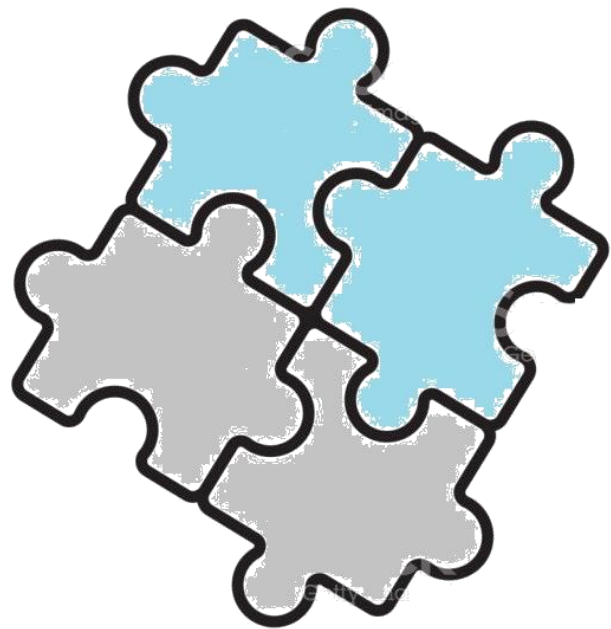
Supporting Entities



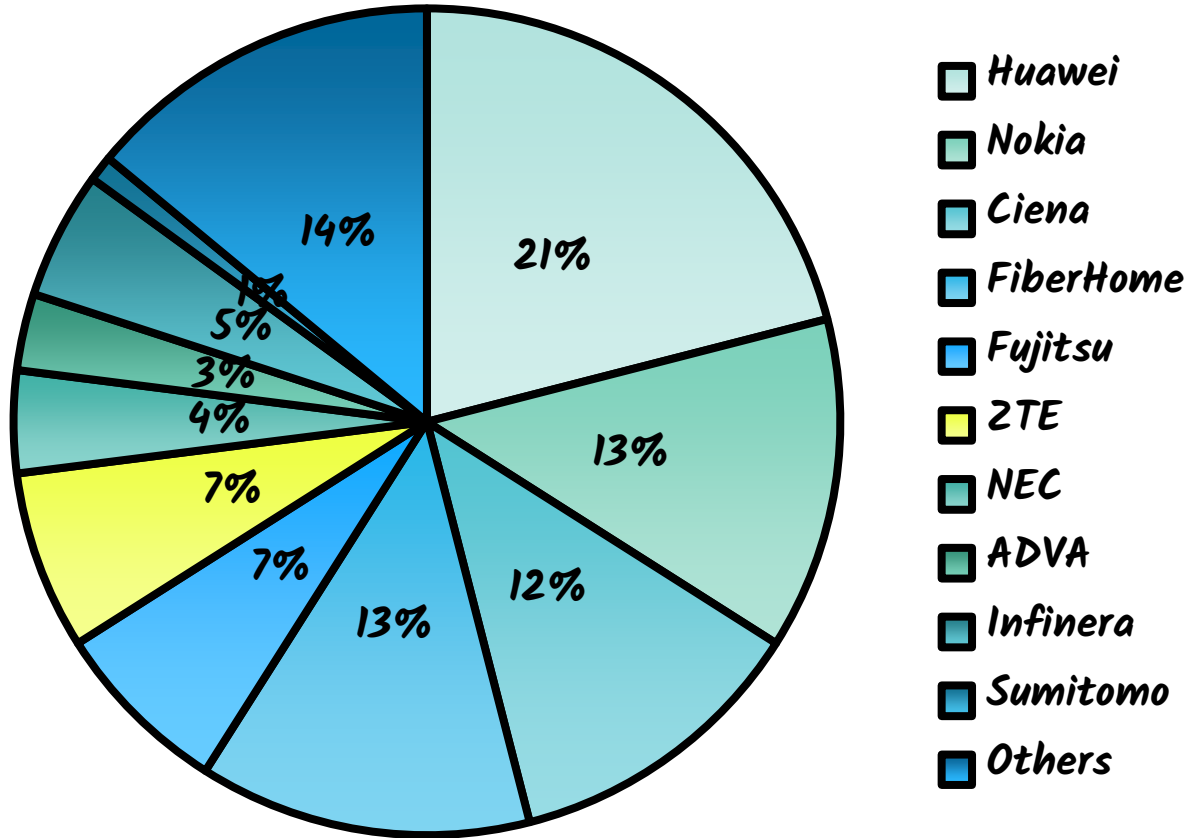
70
billions
of €

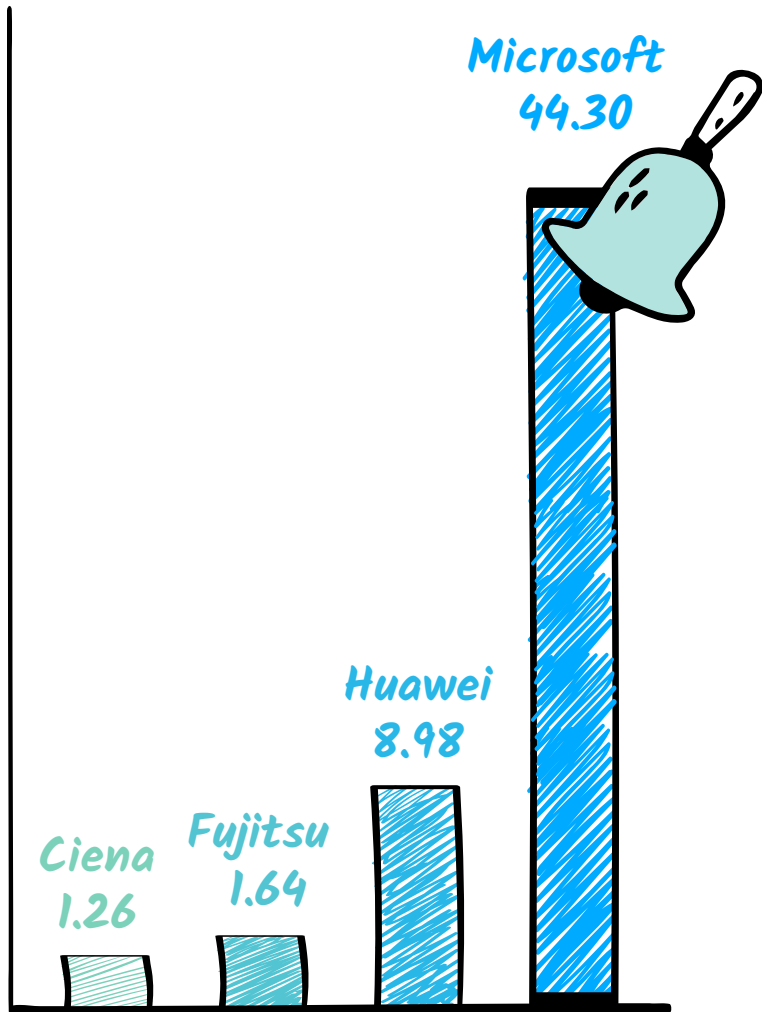


- ICT
- Health
- Materials
- Agriculture
- Environment
- Energy
- Transport
- Social Science
- Space
- Security
- Others



Market Share





IEEE

*IEEE Photonics
Journal*

OSA

Optics Express

OSA

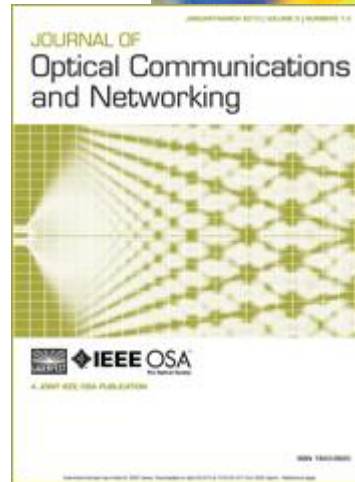
Optics Letters

IEEE/OSA

*IEEE/OSA Journal of
Lightwave
Technology*

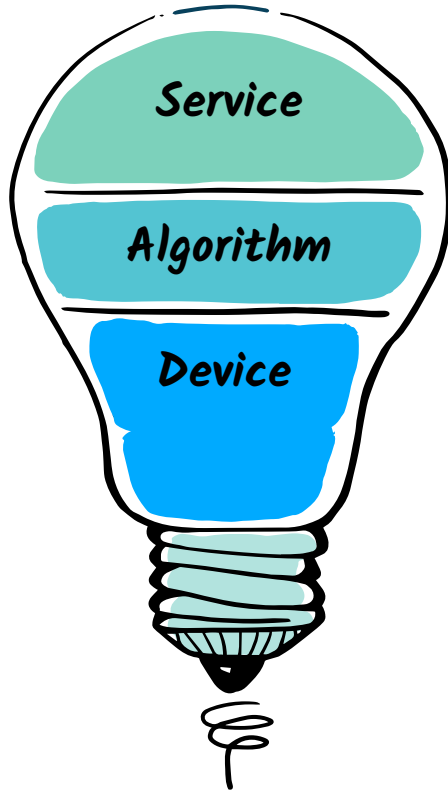
OSA/IEEE

*OSA/IEEE Journal of
Optical
Communications and
Networking*





Real Applicability



Application Layer



Control Layer



Infrastructure Layer

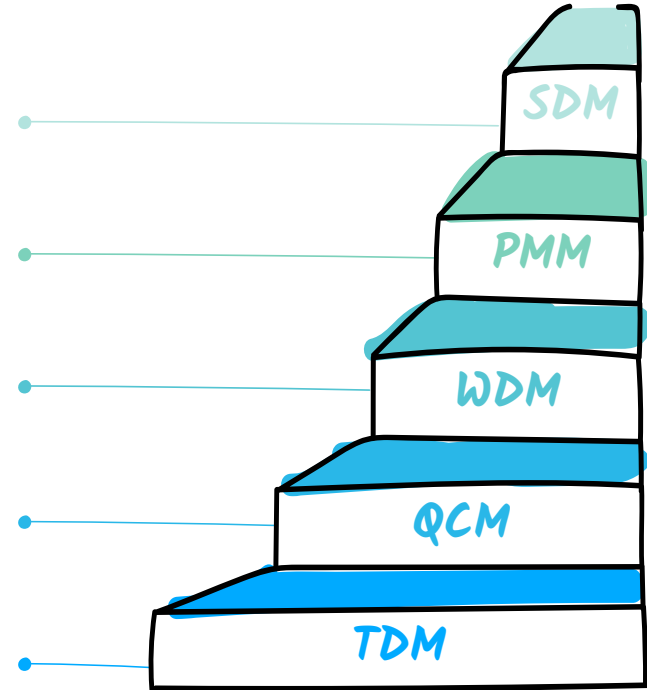
Space Division Multiplexing

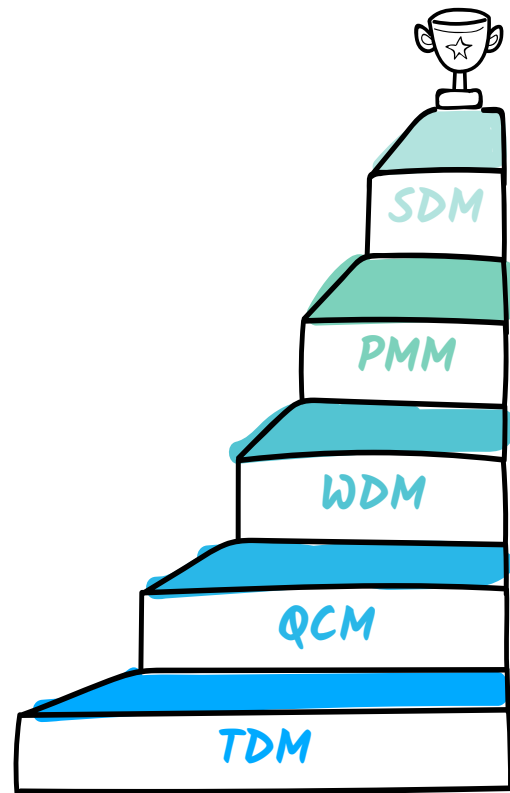
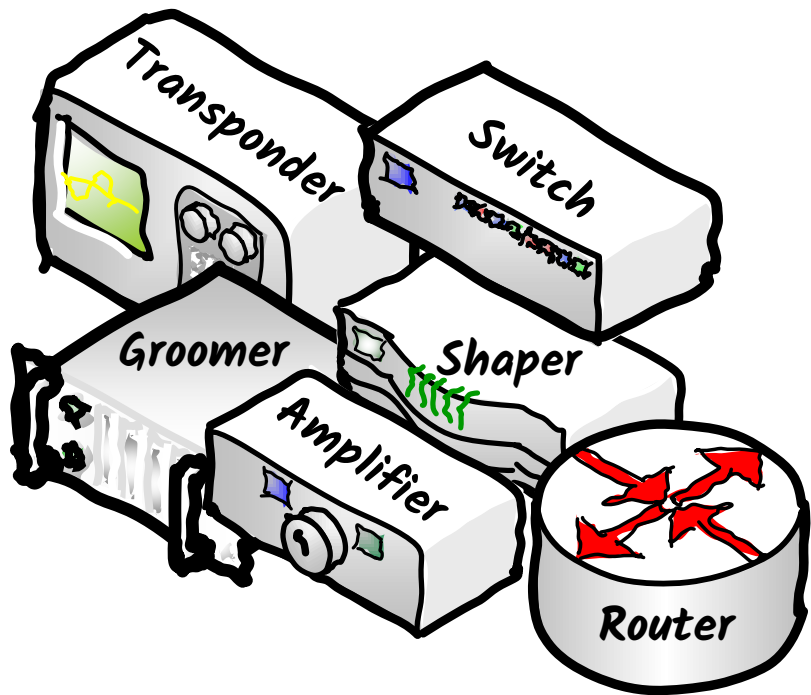
Polarization Mode Multiplexing

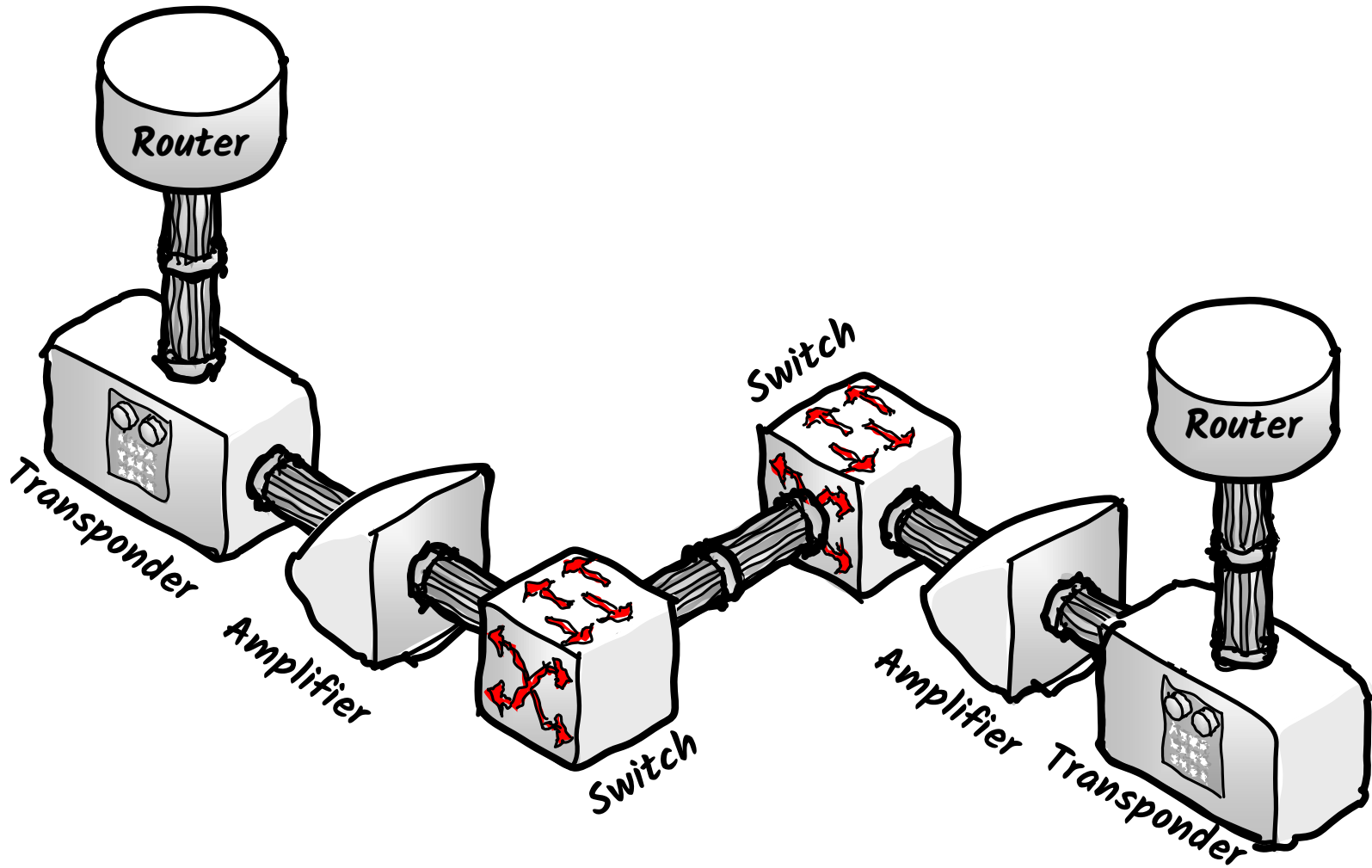
Wavelength Division Multiplexing

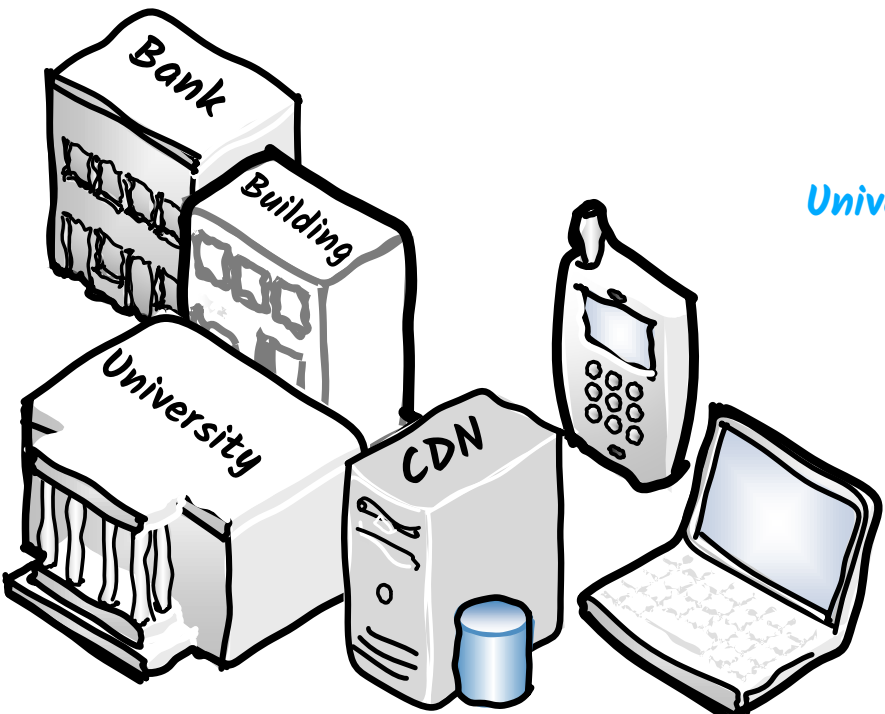
Quadrature Component Multiplexing

Time Division Multiplexing







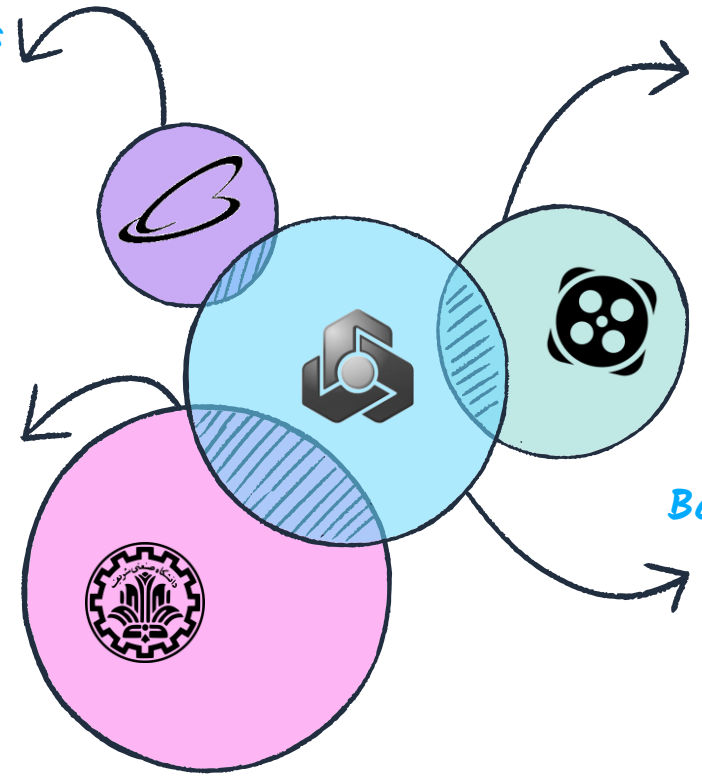


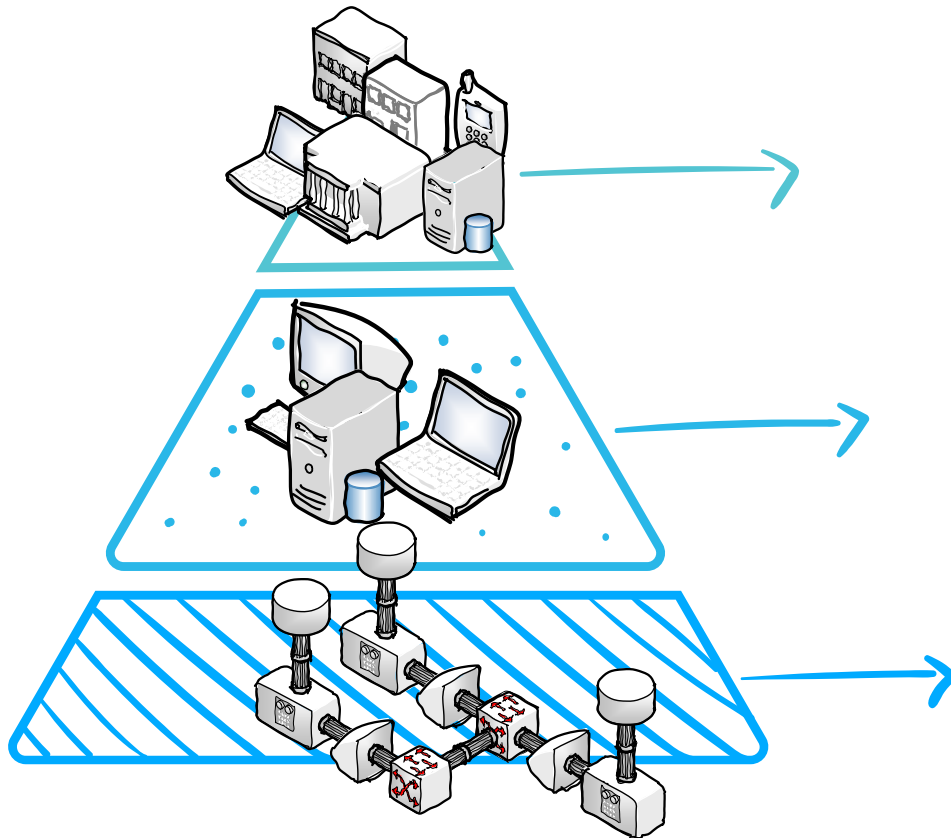
Mobile Operators

Content Providers

Universities

Banks





Application

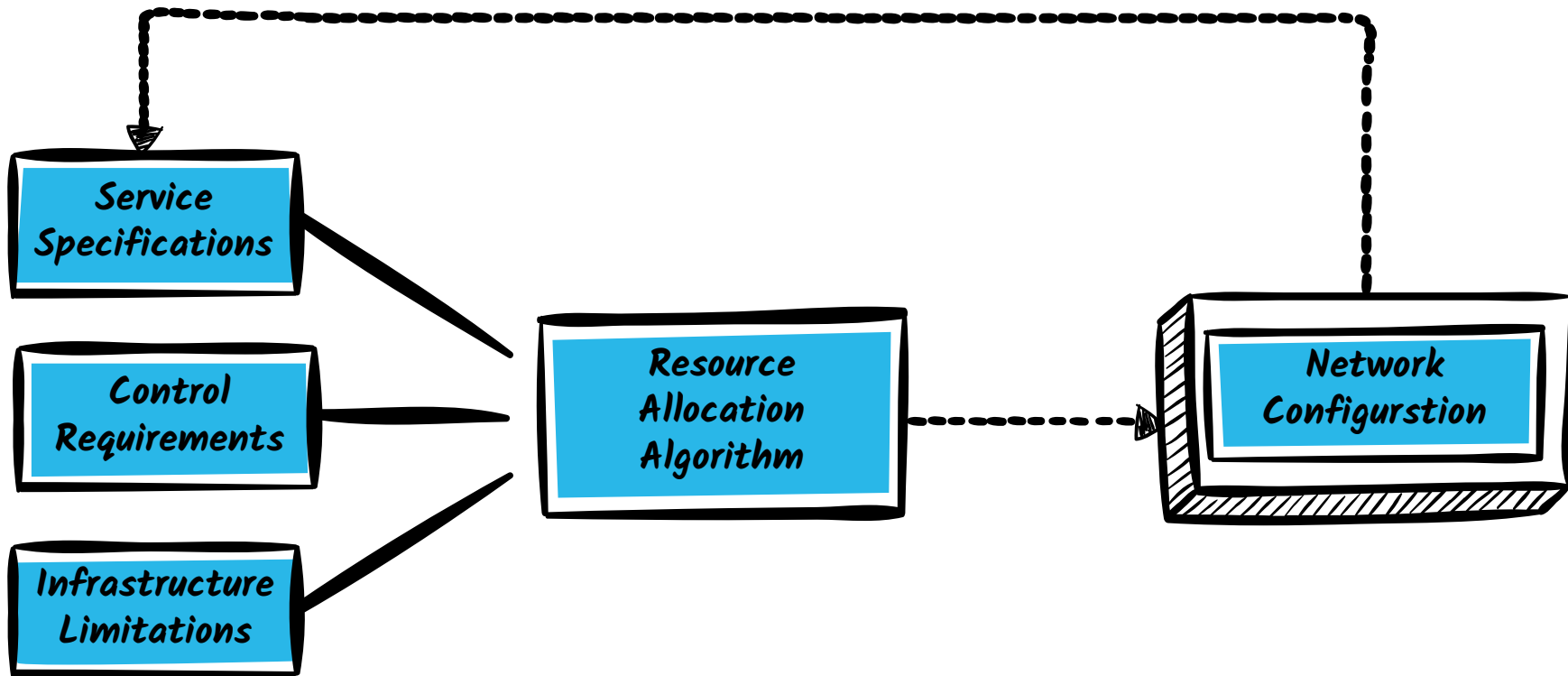
Services

Control

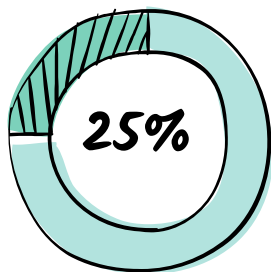
Algorithms

Infrastructure

Devices



Note: Large-Scale Dynamic Stochastic Optimization



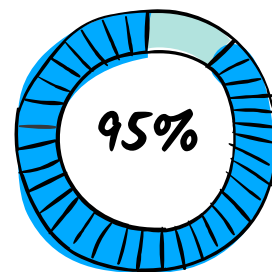
*Available
Spectrum*



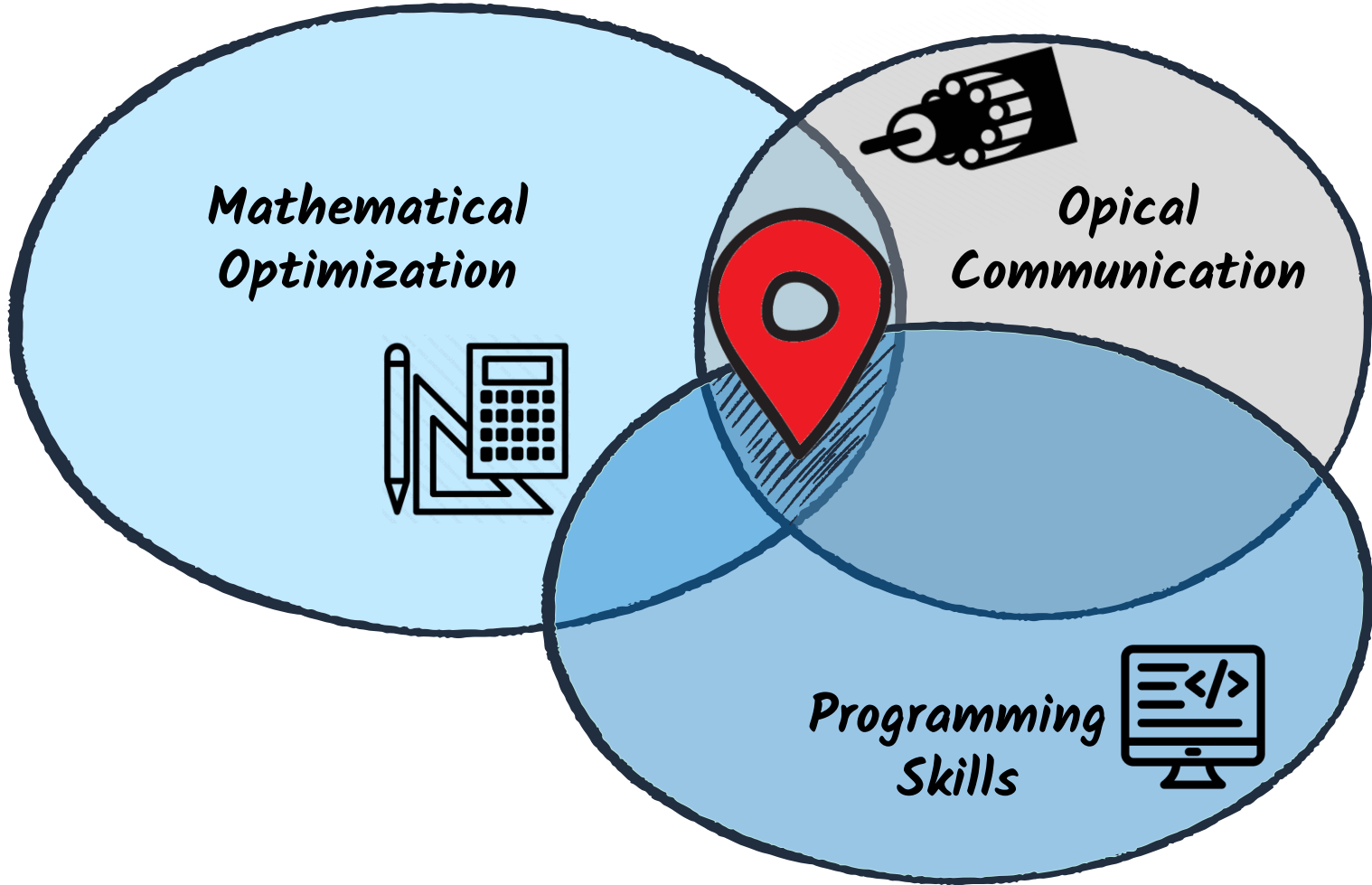
*Power
Consumption*



*Operational
Expenditures*



*Network
Capacity*





mohammad.hadi@sharif.edu



<https://scholar.google.com/citations?user=7kySgwkAAAAJ&hl=en>



<https://www.linkedin.com/in/mohammad-hadi-305a69102/>





Optical Fiber Networks

*Mohammad Hadi
Sharif University of Technology*

