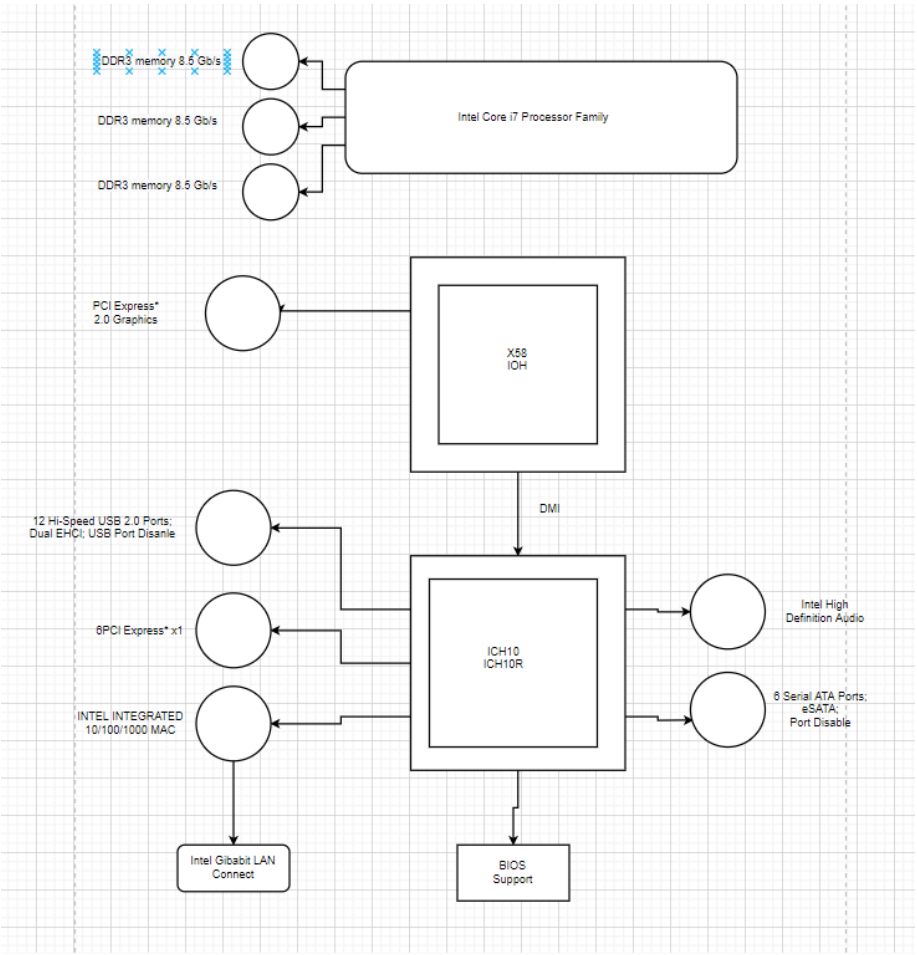
Intel Core i9 10900KF

Intel Core i9 10900 is CISC because its architecture is Comet Lake and Comet Lake has x86-64 instructions set and CISC types has x86-64 instructions set. Thus, we compare i9 10900KF with i7 920 Nehalem.

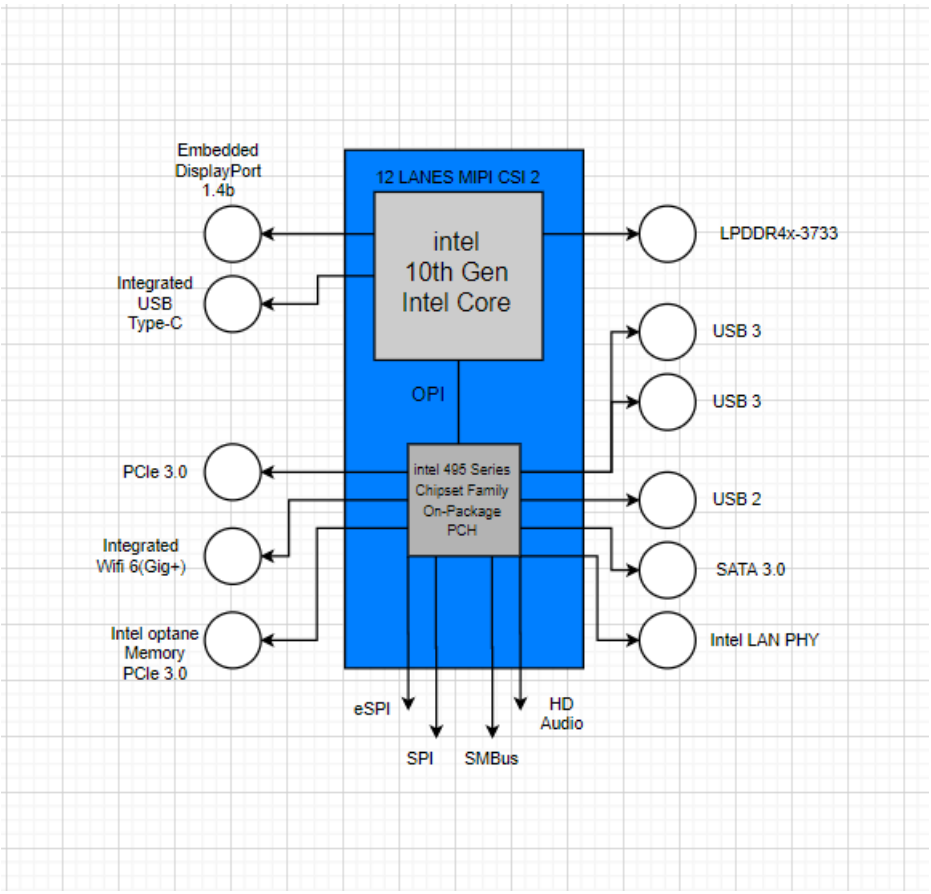
First, i9 has Comet Lake architecture and i7 920 has Nehalem architecture. Also, when i7 has 2.67 GHz frequency, 4 cores and 8 threads; i9 has 3.7 GHz frequency, 10 cores and 20 threads. Intel i9 10900KF has 14 nm semiconductor technology but Intel Core i7 920 has 45 nm semiconductor technology.

Block Diagrams:

Intel Core i7 920:



Intel Core i9 10900KF:

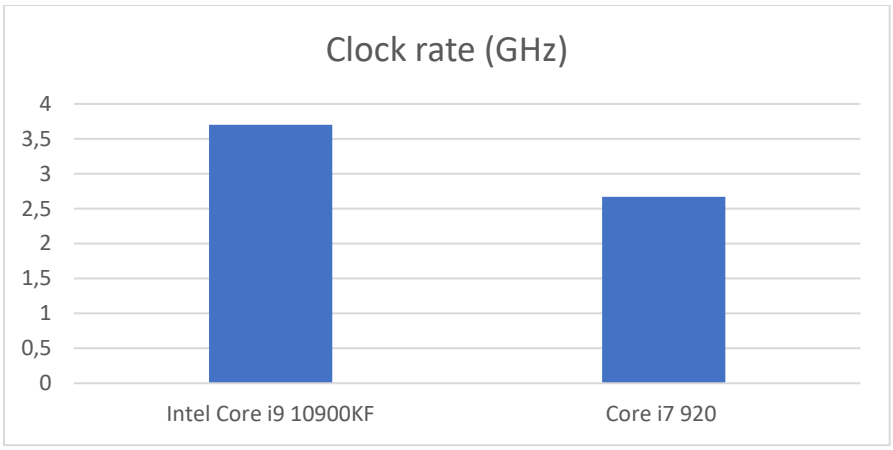


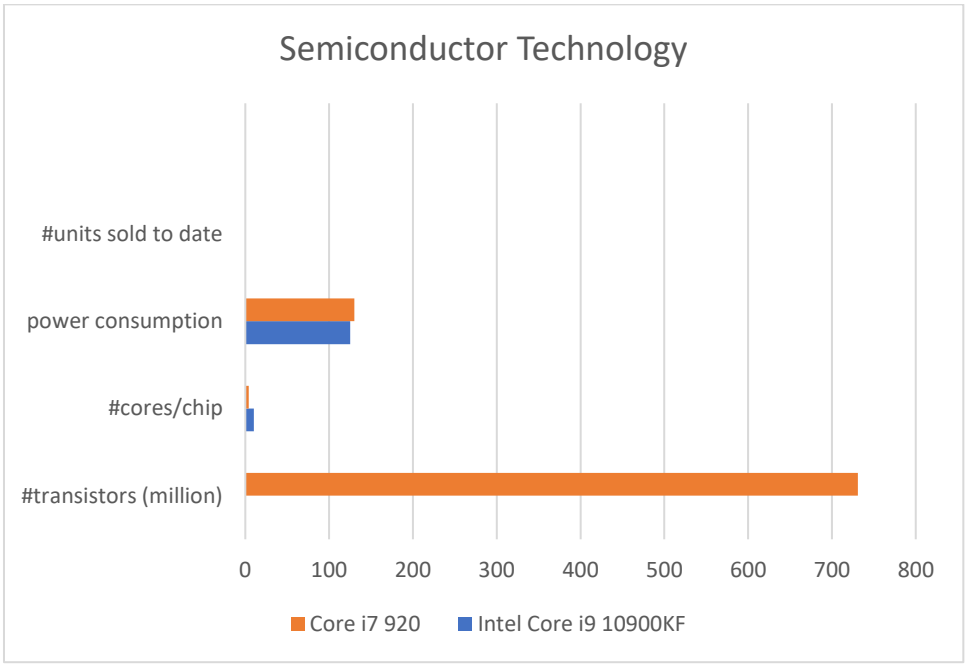
Application Areas:

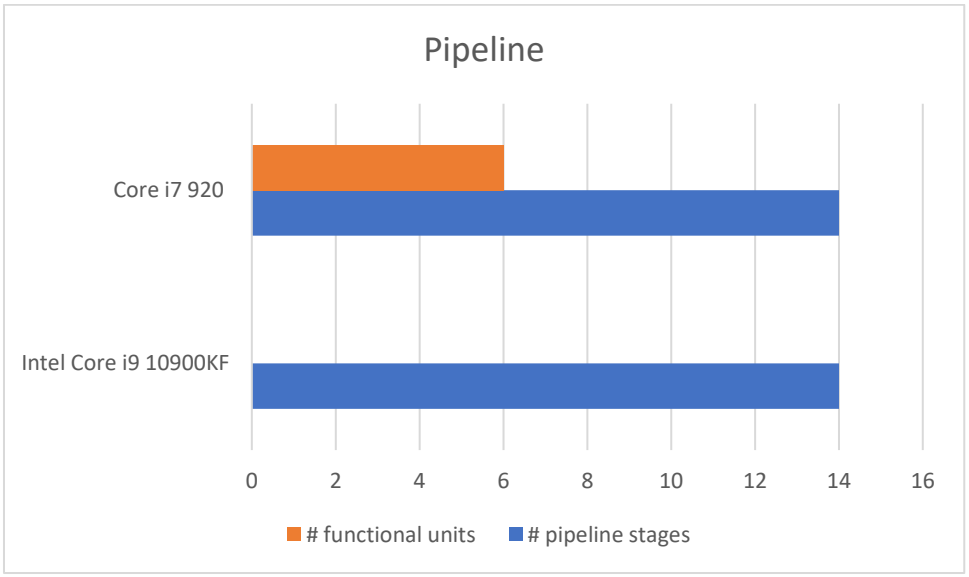
When i7 has been used for clouding and server systems, i9 has been used for performance like gaming computer, visual design computers or clients. Because of i9 clock rates is very high and when playing games, there is almost no FPS (Frame per second) drop and the games can be played ultra-high graphical resolutions and, too much data must be processed in clients, so i9 can handled it. On the other hand, for i7, because of its lower clock rates; cache and instructions set and lower thread, it is more available for clouding and server system. Also, i9 can be used for server and clouding system but due to its high performance, it is not needed, and it has used for gaming and areas that are needed high performance.

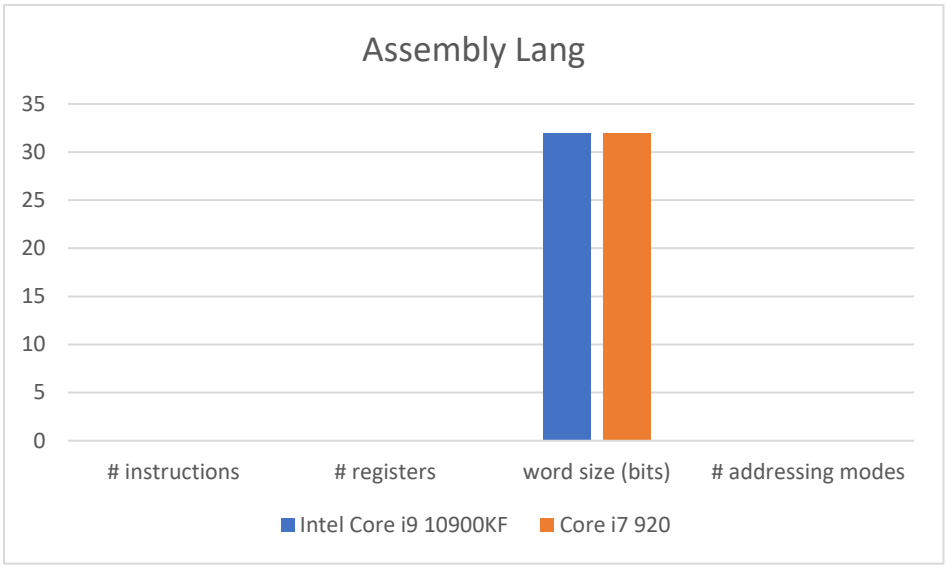
In line with most of benchmark comparing sites, in the date of now, i9 is one of the best 10 microprocessors because of its performance but i7 is not one of the best 100 microprocessors.

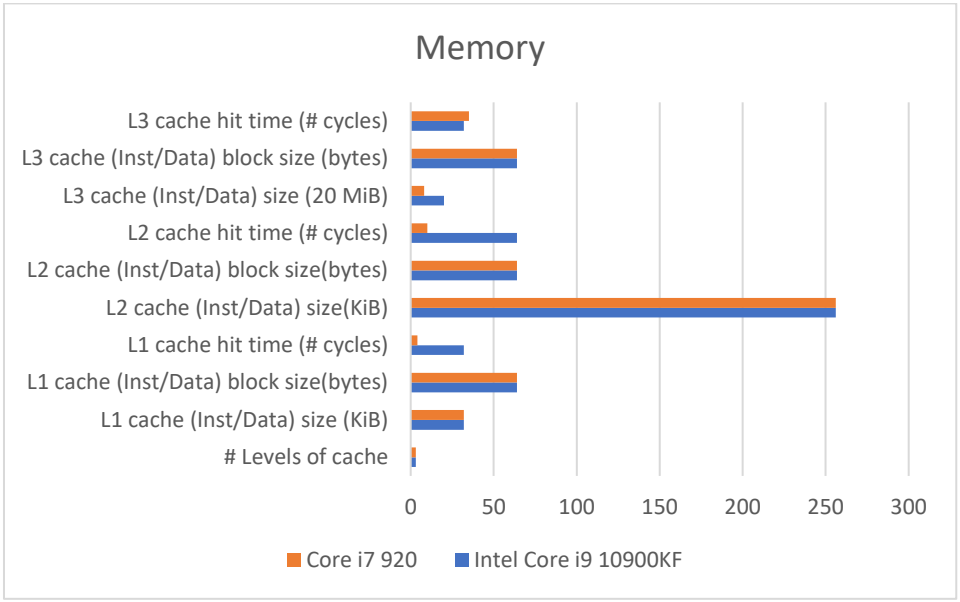
In the graphics shown below, we will be comparing of both i7 and i9.

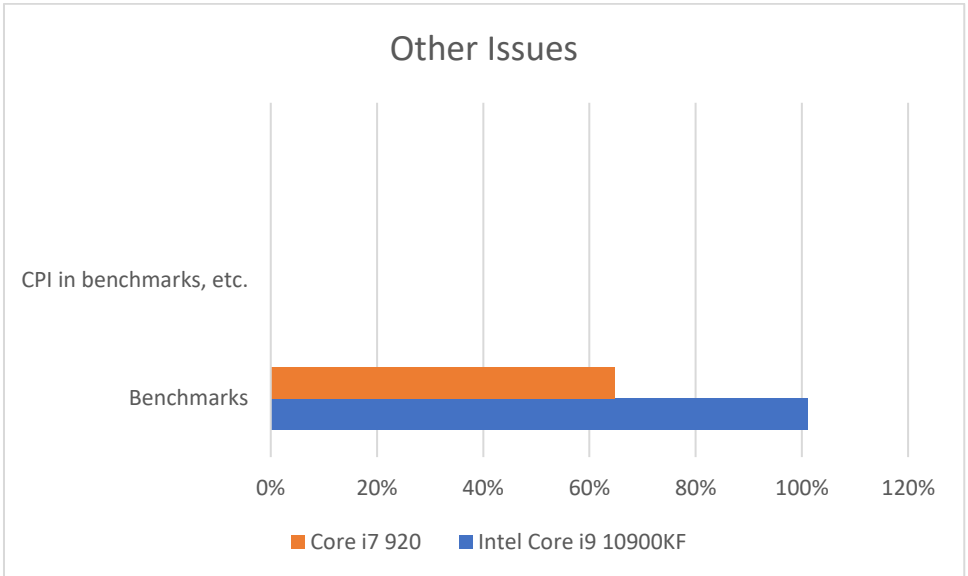







Assembly Lang
35
30
25
20
15
10
5
0
instructions
registers
word size (bits)
addressing modes
Intel Core i9 10900KF
Core i7 920


Memory
L3 cache hit time (# cycles)
L3 cache (Inst/Data) block size (bytes)
L3 cache (Inst/Data) size (20 MiB)
L2 cache hit time (# cycles)
L2 cache (Inst/Data) block size(bytes)
L2 cache (Inst/Data) size(KiB)
L1 cache hit time (# cycles)
L1 cache (Inst/Data) block size(bytes)
L1 cache (Inst/Data) size (KiB)
Levels of cache
0
50
100
150
200
250
300
Core i7 920
Intel Core i9 10900KF


Other Issues
CPI in benchmarks, etc.
Benchmarks
0%
20%
40%
60%
80%
100%
120%
Core i7 920
Intel Core i9 10900KF

The Given Table:

	i9 10900 KF	**Core i7 920**
GENERAL		
Designed by (company)	Intel	Intel
Produced by (company)	Intel	Intel
Year	2020	2008
Clock rate	3.7 GHz	2.67 GHz
SEMICONDUCTOR TECHNOLOGY		
#transistors	Unknown*	731 million
#cores/chip	10	4
power consumption	125 W	130 W
#units sold to date		
Type: RISC/CISC/GPU	CISC	CISC
ASSEMBLY LANG		
# instructions	32	16
Instruction types (basic, floating point, vector, etc.)	Floating points	Floating points
# registers		
word size	32 bits	32 bits
# addressing modes	8	4

PIPELINE		
# pipeline stages	14	14
# functional units		6
multiple issue (Yes/No) dynamic/static	Yes, dynamic	Yes, dynamic
pipeline control: hardwired/microprogrammed	microprogrammed	microprogrammed
Out-of-Order speculation (Yes/No)	Yes	Yes
Branch speculation (Yes/No)	Yes	Yes
Load speculation (Yes/No)	No	No
MEMORY		
# Levels of cache	3	3
L1 cache (Inst/Data) size	32 KiB each for instructions/data per core	32 KiB each for instructions/data per core
L1 cache (Inst/Data) block size	64 bytes	64 bytes
L1 cache (Inst/Data) mechanism (direct mapped/assoc./set assoc.)	8 way (I), 8 way(D) set associative	4 way (I), 8 way(D) set associative
L1 cache write mechanism	Write back	Write back, No-write allocate
L1 replacement policy	Approximately LRU	Approximately LRU
L1 cache hit time (# cycles)	32 clock cycles	4 clock cycles
L2 cache (Inst/Data) size	256 KiB	256 KiB
L2 cache (Inst/Data) block size	64 bytes	64 bytes
L2 cache (Inst/Data) mechanism (direct mapped/assoc./set assoc.)	8 way set associative	8 way associative

L2 cache write mechanism	Write back	Write back
L2 replacement policy	Approximately LRU	Approximately LRU
L2 cache hit time (# cycles)	64 clock cycles	10 clock cycles
L3 cache (Inst/Data) size	20 MiB	8 MiB
L3 cache (Inst/Data) block size	64 bytes	64 bytes
L3 cache (Inst/Data) mechanism (direct mapped/assoc./set assoc.)	16 way set associative	16 way set associative
L3 cache write mechanism	Write back	Write back, Write allocate
L3 replacement policy	Approximately LRU	Approximately LRU
L3 cache hit time (# cycles)	32 clock cycles	35 clock cycles
TLB levels, organization	1 TLB for instructions and 1 TLB for data per core	1 TLB for instructions and 1 TLB for data per core
physical address space		44 bits
virtual address space		48 bits
page size		Variable 4 KiB, 2/4 MiB
OTHER ISSUES		
Benchmarks	%101	%64.7
CPI in benchmarks, etc.		

In line with the data given above table and explains, i9 10900KF is faster and better than Core i7 920, because of number of cores, frequencies, and number of threads. i9 can handle too much data, can display more resolutions, and can give more FPS with your feature. On the other hand, I have no data about their sold numbers but, because of prices of i9 and i7(i9 price about is $470, i7 price is about $310) the release date of i9 is April 2020 and contraction in the global economy due to coronavirus pandemic; and logistic issue in this pandemic term, I think i9 10900KF could not reach that high sales figure. Also, release date of i7 920 is 2008 and it had very high features in its release dates. When these conditions are taken into consideration, sold number of i7 reach more higher level than sold number of i9.

Pipeline values of both microprocessors are almost same except number of functional units. However, I could not find any data about functional units of i9, so this issue cannot be argument issue. Actually, it is said that i7 920 is high quality processor in line with its release date because before 12 years ago from i9, it has almost same features with i9 on pipeline.

With the development of the technology, we can use more quality and improving technologic devices. From 2008 to 2020, memory spaces are developed in devices. Comparing i9 and i7 is the one of the examples for this situation. Both microprocessors have 3 caches and same replacement policies. Also, both of them almost same cache mechanism and same cache block size. However, it can be shown that data sizes and number of clock cycles of both of them are so different. Maximum memory sizes of i7 equals 24GiB and Maximum memory sizes of i9 equals 128 GiB. We can said that level of power consumption of i9 is higher than i7's in line with clock cycles, memory sizes, process, number of threads and number of cores. However, power consumption of i9 is lower that i7's. The value can be seen table above. So, We can say that Intel Core i9 10900KF is more efficient both power consumption and performance than Intel Core i7 920. Also, it can be seen on prices of them.

As a conclusion, both microprocessors has higher level of technology but i9 has more higher of it.

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