Kirjandus OpenCLi kohta:

[https://www.khronos.org/**opencl**/](https://www.khronos.org/opencl/)

[www.drdobbs.com/parallel/a-gentle-introduction-to-**opencl**/231002854](http://www.drdobbs.com/parallel/a-gentle-introduction-to-opencl/231002854)

[www.cc.gatech.edu/~vetter/keeneland/tutorial.../06-intro\_to\_**opencl**.pdf](http://www.cc.gatech.edu/~vetter/keeneland/tutorial.../06-intro_to_opencl.pdf)

**Open Computing Language** ( **OpenCL** ) is a [framework](https://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=et&rurl=translate.google.ee&sl=en&tl=et&u=https://en.wikipedia.org/wiki/Software_framework&usg=ALkJrhjuCajbgNYS3hGkSgMayfO05-iPlQ) for writing programs that execute across [heterogeneous](https://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=et&rurl=translate.google.ee&sl=en&tl=et&u=https://en.wikipedia.org/wiki/Heterogeneous_computing&usg=ALkJrhiCwnbEcdN75C0rqQFWfBXRSqhfXA) platforms consisting of [central processing units](https://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=et&rurl=translate.google.ee&sl=en&tl=et&u=https://en.wikipedia.org/wiki/Central_processing_unit&usg=ALkJrhhHKVTwDTxA75vdfSB7UnUwcjAE5g) (CPUs), [graphics processing units](https://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=et&rurl=translate.google.ee&sl=en&tl=et&u=https://en.wikipedia.org/wiki/Graphics_processing_unit&usg=ALkJrhioNw5Zj80LH8MK_63TYnjbMcpW7Q) (GPUs), [digital signal processors](https://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=et&rurl=translate.google.ee&sl=en&tl=et&u=https://en.wikipedia.org/wiki/Digital_signal_processor&usg=ALkJrhhlyvnLBo0p2M9c8q-HD7cfwSwKjw) (DSPs), [field-programmable gate arrays](https://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=et&rurl=translate.google.ee&sl=en&tl=et&u=https://en.wikipedia.org/wiki/Field-programmable_gate_array&usg=ALkJrhhFnJ13saEADm5HnN-ua9mhDReevQ) (FPGAs) and other processors or [hardware accelerators](https://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=et&rurl=translate.google.ee&sl=en&tl=et&u=https://en.wikipedia.org/wiki/Hardware_accelerator&usg=ALkJrhhnTiNuphO5zH_z0ipbB-MvrQKDdw) . OpenCL specifies a [programming language](https://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=et&rurl=translate.google.ee&sl=en&tl=et&u=https://en.wikipedia.org/wiki/Programming_language&usg=ALkJrhghk8BJksEcrwiByfMArV85b7uuXQ) (based on [C99](https://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=et&rurl=translate.google.ee&sl=en&tl=et&u=https://en.wikipedia.org/wiki/C99&usg=ALkJrhiEWk-uWOqGIY3BgL5skYgXSxXLrg) ) for programming these [devices](https://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=et&rurl=translate.google.ee&sl=en&tl=et&u=https://en.wikipedia.org/wiki/Personal_computer_hardware&usg=ALkJrhiqwxew37u40rrSIjHhb_lLuuP2SA) and [application programming interfaces](https://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=et&rurl=translate.google.ee&sl=en&tl=et&u=https://en.wikipedia.org/wiki/Application_programming_interface&usg=ALkJrhiyNrO_mzg8cVumi-vDw2IBmotTnw) (APIs) to control the platform and execute programs on the [compute devices](https://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=et&rurl=translate.google.ee&sl=en&tl=et&u=https://en.wikipedia.org/wiki/OpenCL_compute_devices&usg=ALkJrhjoe1vknNZpg-scu3-erZKLpXJ1Wg) . OpenCL provides a standard interface for [parallel computing](https://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=et&rurl=translate.google.ee&sl=en&tl=et&u=https://en.wikipedia.org/wiki/Parallel_computing&usg=ALkJrhiN9AG2fJQOV5DVLxGneEBPuFGbdg) using [task-based](https://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=et&rurl=translate.google.ee&sl=en&tl=et&u=https://en.wikipedia.org/wiki/Task_parallelism&usg=ALkJrhilGGPnoEe6D2DSXfLmMU9sUAuoUA) and [data-based parallelism](https://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=et&rurl=translate.google.ee&sl=en&tl=et&u=https://en.wikipedia.org/wiki/Data_parallelism&usg=ALkJrhhFziFDXmolTtvgIbSIa94pCGvx6w) .

OpenCL is an open standard maintained by the [non-profit](https://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=et&rurl=translate.google.ee&sl=en&tl=et&u=https://en.wikipedia.org/wiki/Non-profit_organization&usg=ALkJrhhcO68SLGRqXoG_i_htrBt8PcDXOg) technology consortium [Khronos Group](https://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=et&rurl=translate.google.ee&sl=en&tl=et&u=https://en.wikipedia.org/wiki/Khronos_Group&usg=ALkJrhiHxsf7LKoJck-g-3Yy2pyYak3X0g) . Conformant implementations are available from [Altera](https://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=et&rurl=translate.google.ee&sl=en&tl=et&u=https://en.wikipedia.org/wiki/Altera&usg=ALkJrhgdBglVfIE4f-0r0gzS8TX0lrgHMA) , [AMD](https://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=et&rurl=translate.google.ee&sl=en&tl=et&u=https://en.wikipedia.org/wiki/Advanced_Micro_Devices&usg=ALkJrhj37D3NHrLK5qE-Fd0RgEftkc80CA) , [Apple](https://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=et&rurl=translate.google.ee&sl=en&tl=et&u=https://en.wikipedia.org/wiki/Apple_Inc&usg=ALkJrhh0FOQtJVlx4-2VMWrGJsZTJ9PD1w) , [ARM Holdings](https://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=et&rurl=translate.google.ee&sl=en&tl=et&u=https://en.wikipedia.org/wiki/ARM_Holdings&usg=ALkJrhg4czK-m7ln8W2OAkl6qmT1U0JyGw) , [Creative Technology](https://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=et&rurl=translate.google.ee&sl=en&tl=et&u=https://en.wikipedia.org/wiki/Creative_Technology&usg=ALkJrhjDyEYL03rABxYDzuXjodwpShpEkg) , [IBM](https://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=et&rurl=translate.google.ee&sl=en&tl=et&u=https://en.wikipedia.org/wiki/IBM&usg=ALkJrhg3J0jjyMs5EV1aAQswEuEt_TsbWQ) ,[Imagination Technologies](https://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=et&rurl=translate.google.ee&sl=en&tl=et&u=https://en.wikipedia.org/wiki/Imagination_Technologies&usg=ALkJrhhcktFrnEuHUGKtKvnxQrd-oEbZWQ) , [Intel](https://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=et&rurl=translate.google.ee&sl=en&tl=et&u=https://en.wikipedia.org/wiki/Intel&usg=ALkJrhjtcL6vquXoWEyhvvFlIVrAw5rLPg) , [Nvidia](https://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=et&rurl=translate.google.ee&sl=en&tl=et&u=https://en.wikipedia.org/wiki/Nvidia&usg=ALkJrhhxAa17Nr0XPq9lfSw1Or-la0Venw) , [Qualcomm](https://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=et&rurl=translate.google.ee&sl=en&tl=et&u=https://en.wikipedia.org/wiki/Qualcomm&usg=ALkJrhitJSDb0_OYldf42tDvwKCmugdnFw) , [Samsung](https://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=et&rurl=translate.google.ee&sl=en&tl=et&u=https://en.wikipedia.org/wiki/Samsung&usg=ALkJrhijDKcyRMDVja_p72P_yJLPv3EkEg) , [Vivante](https://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=et&rurl=translate.google.ee&sl=en&tl=et&u=https://en.wikipedia.org/wiki/Vivante&usg=ALkJrhjG0TpwUTTU2m15xrKt0FtR9GRuQQ) , [Xilinx](https://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=et&rurl=translate.google.ee&sl=en&tl=et&u=https://en.wikipedia.org/wiki/Xilinx&usg=ALkJrhjbmMsrPdm5ONXTyd6fXw0bImEBZA) , and [ZiiLABS](https://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=et&rurl=translate.google.ee&sl=en&tl=et&u=https://en.wikipedia.org/wiki/ZiiLABS&usg=ALkJrhiuHD-0v_r_iZr36kWVMK4gJRM4qw) . [[8]](https://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=et&rurl=translate.google.ee&sl=en&tl=et&u=https://en.wikipedia.org/wiki/OpenCL&usg=ALkJrhh35YrPVYZt9knWIFl8aLiVUygShw#cite_note-8) [[9]](https://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=et&rurl=translate.google.ee&sl=en&tl=et&u=https://en.wikipedia.org/wiki/OpenCL&usg=ALkJrhh35YrPVYZt9knWIFl8aLiVUygShw#cite_note-9)

**Contents**

* [1Overview](https://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=et&rurl=translate.google.ee&sl=en&tl=et&u=https://en.wikipedia.org/wiki/OpenCL&usg=ALkJrhh35YrPVYZt9knWIFl8aLiVUygShw#Overview)
  + [1.1Memory hierarchy](https://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=et&rurl=translate.google.ee&sl=en&tl=et&u=https://en.wikipedia.org/wiki/OpenCL&usg=ALkJrhh35YrPVYZt9knWIFl8aLiVUygShw#Memory_hierarchy)
* [2OpenCL C language](https://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=et&rurl=translate.google.ee&sl=en&tl=et&u=https://en.wikipedia.org/wiki/OpenCL&usg=ALkJrhh35YrPVYZt9knWIFl8aLiVUygShw#OpenCL_C_language)
  + [2.1Example: matrix-vector multiplication](https://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=et&rurl=translate.google.ee&sl=en&tl=et&u=https://en.wikipedia.org/wiki/OpenCL&usg=ALkJrhh35YrPVYZt9knWIFl8aLiVUygShw#Example:_matrix-vector_multiplication)
  + [2.2Example: computing the FFT](https://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=et&rurl=translate.google.ee&sl=en&tl=et&u=https://en.wikipedia.org/wiki/OpenCL&usg=ALkJrhh35YrPVYZt9knWIFl8aLiVUygShw#Example:_computing_the_FFT)
* [3History](https://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=et&rurl=translate.google.ee&sl=en&tl=et&u=https://en.wikipedia.org/wiki/OpenCL&usg=ALkJrhh35YrPVYZt9knWIFl8aLiVUygShw#History)
  + [3.1OpenCL 1.0](https://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=et&rurl=translate.google.ee&sl=en&tl=et&u=https://en.wikipedia.org/wiki/OpenCL&usg=ALkJrhh35YrPVYZt9knWIFl8aLiVUygShw#OpenCL_1.0)
  + [3.2OpenCL 1.1](https://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=et&rurl=translate.google.ee&sl=en&tl=et&u=https://en.wikipedia.org/wiki/OpenCL&usg=ALkJrhh35YrPVYZt9knWIFl8aLiVUygShw#OpenCL_1.1)
  + [3.3OpenCL 1.2](https://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=et&rurl=translate.google.ee&sl=en&tl=et&u=https://en.wikipedia.org/wiki/OpenCL&usg=ALkJrhh35YrPVYZt9knWIFl8aLiVUygShw#OpenCL_1.2)
  + [3.4OpenCL 2.0](https://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=et&rurl=translate.google.ee&sl=en&tl=et&u=https://en.wikipedia.org/wiki/OpenCL&usg=ALkJrhh35YrPVYZt9knWIFl8aLiVUygShw#OpenCL_2.0)
  + [3.5OpenCL 2.1](https://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=et&rurl=translate.google.ee&sl=en&tl=et&u=https://en.wikipedia.org/wiki/OpenCL&usg=ALkJrhh35YrPVYZt9knWIFl8aLiVUygShw#OpenCL_2.1)
  + [3.6OpenCL 2.2](https://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=et&rurl=translate.google.ee&sl=en&tl=et&u=https://en.wikipedia.org/wiki/OpenCL&usg=ALkJrhh35YrPVYZt9knWIFl8aLiVUygShw#OpenCL_2.2)
* [4Implementations](https://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=et&rurl=translate.google.ee&sl=en&tl=et&u=https://en.wikipedia.org/wiki/OpenCL&usg=ALkJrhh35YrPVYZt9knWIFl8aLiVUygShw#Implementations)
  + [4.1Timeline of vendor implementations](https://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=et&rurl=translate.google.ee&sl=en&tl=et&u=https://en.wikipedia.org/wiki/OpenCL&usg=ALkJrhh35YrPVYZt9knWIFl8aLiVUygShw#Timeline_of_vendor_implementations)
* [5Devices](https://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=et&rurl=translate.google.ee&sl=en&tl=et&u=https://en.wikipedia.org/wiki/OpenCL&usg=ALkJrhh35YrPVYZt9knWIFl8aLiVUygShw#Devices)
  + [5.1Conformant products](https://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=et&rurl=translate.google.ee&sl=en&tl=et&u=https://en.wikipedia.org/wiki/OpenCL&usg=ALkJrhh35YrPVYZt9knWIFl8aLiVUygShw#Conformant_products)
* [6Extensions](https://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=et&rurl=translate.google.ee&sl=en&tl=et&u=https://en.wikipedia.org/wiki/OpenCL&usg=ALkJrhh35YrPVYZt9knWIFl8aLiVUygShw#Extensions)
  + [6.1Device fission](https://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=et&rurl=translate.google.ee&sl=en&tl=et&u=https://en.wikipedia.org/wiki/OpenCL&usg=ALkJrhh35YrPVYZt9knWIFl8aLiVUygShw#Device_fission)
* [7Portability, performance and alternatives](https://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=et&rurl=translate.google.ee&sl=en&tl=et&u=https://en.wikipedia.org/wiki/OpenCL&usg=ALkJrhh35YrPVYZt9knWIFl8aLiVUygShw#Portability.2C_performance_and_alternatives)
* [8See also](https://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=et&rurl=translate.google.ee&sl=en&tl=et&u=https://en.wikipedia.org/wiki/OpenCL&usg=ALkJrhh35YrPVYZt9knWIFl8aLiVUygShw#See_also)
* [9References](https://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=et&rurl=translate.google.ee&sl=en&tl=et&u=https://en.wikipedia.org/wiki/OpenCL&usg=ALkJrhh35YrPVYZt9knWIFl8aLiVUygShw#References)
* [10External links](https://translate.googleusercontent.com/translate_c?anno=2&depth=1&hl=et&rurl=translate.google.ee&sl=en&tl=et&u=https://en.wikipedia.org/wiki/OpenCL&usg=ALkJrhh35YrPVYZt9knWIFl8aLiVUygShw#External_links)

Veel allikaid:

<https://developer.nvidia.com/how-to-cuda-c-cpp>

<https://www.xilinx.com/products/design-tools/software-zone/sdaccel.html>