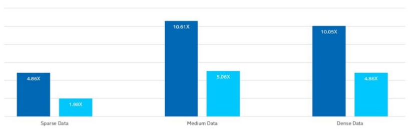

intel Integrated Performance Primitives Cryptography User Guide

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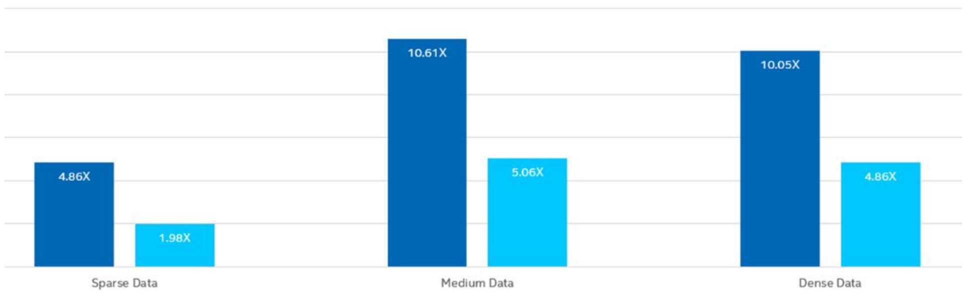
intel Integrated Performance Primitives Cryptography



- Intel® Integrated Performance Primitives (Intel® IPP) Cryptography is a software library that provides a broad range of secure and efficient cryptographic algorithm implementations.

- The library is delivered as a part of Intel® oneAPI Base Toolkit. You may install specific library version as well.
- This get started guide assumes you have installed Intel IPP Cryptography library as a part of the toolkit.

Prerequisites (Windows* OS)

Set Environment Variables

After installing Intel IPP Cryptography, set the PATH, LIB, and INCLUDE environment variables by running the script appropriate to your target platform architecture. The scripts are available in \ippcp\bin. By default, the is C:\Program files (x86)\Intel\oneapi. See Intel IPP high-level directories structure.

Configure Your IDE Environment to Link with Intel IPP Cryptography

To configure your Microsoft* Visual Studio* development system for linking with the Intel IPP Cryptography library, follow the steps below. Though some versions of the Visual Studio* IDE may vary slightly in the menu items mentioned below, the fundamental configuring steps are applicable to all these versions.

1. In Solution Explorer, right-click your project and click Properties.
2. Select Configuration Properties > VC++ Directories and set the following from the Select directories for drop down menu:
    - **Include Files** menu item, and then type in the directory for the Intel IPP Cryptography include files (default is \ippcp\include)
    - **Library Files** menu item, and then type in the directory for the Intel IPP Cryptography library files (default is \ippcp\lib\)
    - **Executable Files** menu item, and then type in the directory for the Intel IPP Cryptography executable files (default is \redist\\ippcp)

Build and Run Your First Intel® IPP Cryptography Application (Windows* OS)

- The code example below represents a short application to help you get started with Intel IPP Cryptography:

```
#define   ippCPUID_SSSE3          0x00000010   /* Supplemental Streaming SIMD Extensions
3                                         */
#define   ippCPUID_MOVBE          0x00000020   /* The processor supports the MOVBE
instruction                                  */
#define   ippCPUID_SSE41          0x00000040   /* Intel® Streaming SIMD Extensions
4.1                                        */
#define   ippCPUID_SSE42          0x00000080   /* Intel® Streaming SIMD Extensions
4.2                                        */
#define   ippCPUID_AVX            0x00000100   /* Intel® Advanced Vector Extensions (Intel®
AVX)                                   */
#define   ippAVX_ENABLEDBYOS      0x00000200   /* The operating system supports Intel
AVX                                         */
#define   ippCPUID_AES            0x00000400   /* Intel® AES New Instructions (Intel® AES-
NI)                                     */
#define   ippCPUID_CLMUL          0x00000800   /* PCLMULQDQ
instruction                                                      */
#define   ippCPUID_ABR            0x00001000   /*
Reserved                                                                   */
#define   ippCPUID_RDRAND         0x00002000   /* Read Random Number
instructions                                            */
#define   ippCPUID_F16C           0x00004000   /* Float16
instructions                                                       */
#define   ippCPUID_AVX2           0x00008000   /* Intel® Advanced Vector Extensions
2                                           */
#define   ippCPUID_ADCOX          0x00010000   /* ADCX and ADOX
instructions                                                */
#define   ippCPUID_RDSEED         0x00020000   /* The RDSEED
instruction                                                     */
#define   ippCPUID_PREFETCHW      0x00040000   /* The PREFETCHW
instruction                                                 */
#define   ippCPUID_SHA            0x00080000   /* Intel® SHA
Extensions                                                    */
#define   ippCPUID_AVX512F        0x00100000   /* Intel® Advanced Vector Extensions 512 (Intel®
AVX-512) Foundation instructions */
#define   ippCPUID_AVX512CD       0x00200000   /* Intel AVX-512 Conflict Detection
instructions                                 */
#define   ippCPUID_AVX512ER       0x00400000   /* Intel AVX-512 Exponential & Reciprocal
instructions                            */
#define   ippCPUID_AVX512PF       0x00800000   /* Intel AVX-512 Prefetch
instructions                                        */
#define   ippCPUID_AVX512BW       0x01000000   /* Intel AVX-512 Byte & Word
instructions                                      */
#define   ippCPUID_AVX512DQ       0x02000000   /* Intel AVX-512 DWord & QWord
instructions                                     */
#define   ippCPUID_AVX512VL       0x04000000   /* Intel AVX-512 Vector Length
extensions                                       */
#define   ippCPUID_AVX512VBMI     0x08000000   /* Intel AVX-512 Vector Bit Manipulation
instructions                              */
#define   ippCPUID_MPX            0x10000000   /* Intel® Memory Protection
Extensions                                         */
#define   ippCPUID_AVX512_4FMADDPS 0x20000000  /* Intel AVX-512 DL floating-point single
precision                                   */
#define   ippCPUID_AVX512_4VNNIW  0x40000000   /* Intel AVX-512 DL enhanced word variable
precision                                  */
#define   ippCPUID_KNC            0x80000000   /* Intel® Xeon Phi™
Coprocessor                                            */

int main(int argc, char* argv[])
```

```
{
   const IppLibraryVersion *lib;
   IppStatus status;
   Ipp64u mask, emask;

   /* Get Intel IPP Cryptography library version info */
   lib = ippcpGetLibVersion();
   printf("%s %s\n", lib->Name, lib->Version);

   /* Get CPU features and features enabled with selected library level */
   status = ippcpGetCpuFeatures( &mask );
   if( ippStsNoErr == status ) {
      emask = ippcpGetEnabledCpuFeatures();
      printf("Features supported by CPU\tby Intel® Integrated Performance Primitives Cryptography
\n");
      printf("-----------------------------------------\n");
      printf("  ippCPUID_MMX        = ");
      printf("%c\t%c\t",( mask & ippCPUID_MMX ) ? 'Y':'N',( emask & ippCPUID_MMX ) ? 'Y':'N');
      printf("Intel® Architecture MMX technology supported\n");
      printf("  ippCPUID_SSE        = ");
      printf("%c\t%c\t",( mask & ippCPUID_SSE ) ? 'Y':'N',( emask & ippCPUID_SSE ) ? 'Y':'N');
      printf("Intel® Streaming SIMD Extensions\n");
      printf("  ippCPUID_SSE2       = ");
      printf("%c\t%c\t",( mask & ippCPUID_SSE2 ) ? 'Y':'N',( emask & ippCPUID_SSE2 ) ? 'Y':'N');
      printf("Intel® Streaming SIMD Extensions 2\n");
      printf("  ippCPUID_SSE3       = ");
      printf("%c\t%c\t",( mask & ippCPUID_SSE3 ) ? 'Y':'N',( emask & ippCPUID_SSE3 ) ? 'Y':'N');
      printf("Intel® Streaming SIMD Extensions 3\n");
      printf("  ippCPUID_SSSE3      = ");
      printf("%c\t%c\t",( mask & ippCPUID_SSSE3 ) ? 'Y':'N',( emask & ippCPUID_SSSE3 ) ?
'Y':'N');
      printf("Supplemental Streaming SIMD Extensions 3\n");
      printf("  ippCPUID_MOVBE      = ");
      printf("%c\t%c\t",( mask & ippCPUID_MOVBE ) ? 'Y':'N',( emask & ippCPUID_MOVBE ) ?
'Y':'N');
      printf("The processor supports MOVBE instruction\n");
      printf("  ippCPUID_SSE41      = ");
      printf("%c\t%c\t",( mask & ippCPUID_SSE41 ) ? 'Y':'N',( emask & ippCPUID_SSE41 ) ?
'Y':'N');
      printf("Intel® Streaming SIMD Extensions 4.1\n");
      printf("  ippCPUID_SSE42      = ");
      printf("%c\t%c\t",( mask & ippCPUID_SSE42 ) ? 'Y':'N',( emask & ippCPUID_SSE42 ) ?
'Y':'N');
      printf("Intel® Streaming SIMD Extensions 4.2\n");
      printf("  ippCPUID_AVX        = ");
      printf("%c\t%c\t",( mask & ippCPUID_AVX ) ? 'Y':'N',( emask & ippCPUID_AVX ) ? 'Y':'N');
      printf("Intel® Advanced Vector Extensions (Intel® AVX) instruction set\n");
      printf("  ippAVX_ENABLEDBYOS  = ");
      printf("%c\t%c\t",( mask & ippAVX_ENABLEDBYOS ) ? 'Y':'N',( emask & ippAVX_ENABLEDBYOS ) ?
'Y':'N');
      printf("The operating system supports Intel® AVX\n");
      printf("  ippCPUID_AES        = ");
      printf("%c\t%c\t",( mask & ippCPUID_AES ) ? 'Y':'N',( emask & ippCPUID_AES ) ? 'Y':'N');
      printf("Intel® AES instruction\n");
      printf("  ippCPUID_SHA        = ");
      printf("%c\t%c\t",( mask & ippCPUID_SHA ) ? 'Y':'N',( emask & ippCPUID_SHA ) ? 'Y':'N');
      printf("Intel® SHA new instructions\n");
      printf("  ippCPUID_CLMUL      = ");
      printf("%c\t%c\t",( mask & ippCPUID_CLMUL ) ? 'Y':'N',( emask & ippCPUID_CLMUL ) ? 
'Y':'N');
      printf("PCLMULQDQ instruction\n");
      printf("  ippCPUID_RDRAND     = ");
      printf("%c\t%c\t",( mask & ippCPUID_RDRAND ) ? 'Y':'N',( emask & ippCPUID_RDRAND ) ? 
'Y':'N');
      printf("Read Random Number instructions\n");
      printf("  ippCPUID_F16C       = ");
      printf("%c\t%c\t",( mask & ippCPUID_F16C ) ? 'Y':'N',( emask & ippCPUID_F16C ) ? 'Y':'N');
      printf("Float16 instructions\n");
      printf("  ippCPUID_AVX2       = ");
      printf("%c\t%c\t",( mask & ippCPUID_AVX2 ) ? 'Y':'N',( emask & ippCPUID_AVX2 ) ? 'Y':'N');
      printf("Intel® Advanced Vector Extensions 2 instruction set\n");
      printf("  ippCPUID_AVX512F    = ");
      printf("%c\t%c\t",( mask & ippCPUID_AVX512F ) ? 'Y':'N',( emask & ippCPUID_AVX512F ) ? 
'Y':'N');
      printf("Intel® Advanced Vector Extensions 512 Foundation instruction set\n");
      printf("  ippCPUID_AVX512CD   = ");
      printf("%c\t%c\t",( mask & ippCPUID_AVX512CD ) ? 'Y':'N',( emask & ippCPUID_AVX512CD ) ? 
'Y':'N');
      printf("Intel® Advanced Vector Extensions 512 Conflict Detection instruction set\n");
      printf("  ippCPUID_AVX512ER   = ");
      printf("%c\t%c\t",( mask & ippCPUID_AVX512ER ) ? 'Y':'N',( emask & ippCPUID_AVX512ER ) ? 
'Y':'N');
      printf("Intel® Advanced Vector Extensions 512 Exponential & Reciprocal instruction set\n");
      printf("  ippCPUID_ADCOX      = ");
      printf("%c\t%c\t",( mask & ippCPUID_ADCOX ) ? 'Y':'N',( emask & ippCPUID_ADCOX ) ? 
'Y':'N');
      printf("ADCX and ADOX instructions\n");
      printf("  ippCPUID_RDSEED     = ");
      printf("%c\t%c\t",( mask & ippCPUID_RDSEED ) ? 'Y':'N',( emask & ippCPUID_RDSEED ) ? 
'Y':'N');
      printf("The RDSEED instruction\n");
      printf("  ippCPUID_PREFETCHW  = ");
      printf("%c\t%c\t",( mask & ippCPUID_PREFETCHW ) ? 'Y':'N',( emask & ippCPUID_PREFETCHW ) ? 
'Y':'N');
      printf("The PREFETCHW instruction\n");
      printf("  ippCPUID_KNC        = ");
      printf("%c\t%c\t",( mask & ippCPUID_KNC ) ? 'Y':'N',( emask & ippCPUID_KNC ) ? 'Y':'N');
      printf("Intel® Xeon Phi™ Coprocessor instruction set\n");
   }
   return 0;
}
```

- This application consists of two sections:
  1. Get the library layer name and version.
  2. Show the hardware optimizations used by the selected library layer and supported by CPU.
- On Windows* OS, Intel IPP Cryptography applications are significantly easier to build with Microsoft* Visual Studio*. To build the code example above, follow the steps:
  1. Start Microsoft* Visual Studio* and create an empty C++ project.
  2. Add a new c file and paste the code into it.
  3. Set the include directories and the linking model.
  4. Compile and run the application.

Training and Documentation

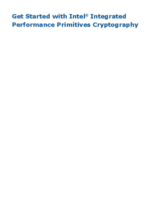
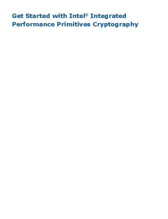
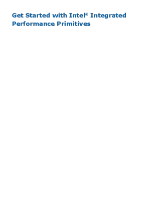
Document	Description
Intel® IPP Cryptography Developer Guide	Provides detailed guidance on Intel IPP Cryptography library configuration, development environment, and linkage modes.
Intel® IPP Cryptography Developer Reference	Contains detailed descriptions of the Intel IPP Cryptography functions.
Intel® Integrated Performance Primitives	Intel® IPP product page. See this page for support and online documentation.

Notices and Disclaimers

Product and Performance Information

- Performance varies by use, configuration and other factors. Learn more at www.Intel.com/PerformanceIndex.
- Notice revision #20201201

Documents / Resources

 Get Started with Intel® Integrated Performance Primitives Cryptography	**intel Integrated Performance Primitives Cryptography** [pdf] User Guide Integrated Performance Primitives Cryptography, Performance Primitives Cryptography, Primitives Cryptography, Cryptography
 Get Started with Intel® Integrated Performance Primitives Cryptography	**intel Integrated Performance Primitives Cryptography** [pdf] User Guide Integrated Performance Primitives Cryptography, Performance Primitives Cryptography, Primitives Cryptography, Cryptography
 Get Started with Intel® Integrated Performance Primitives	**intel Integrated Performance Primitives** [pdf] User Guide Integrated Performance Primitives, Performance Primitives, Primitives

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