

# Native library optimization level research

This page will discuss all our native JDK libraries (except Hotspot) with regard to optimization levels, both what is currently used, and material for discussing a change.

Current C/C++ JDK native libraries, default (bold) and other optimization levels and the size of the libs on various platforms ; info is from JDK25

Optimizing levels marked with \* have special settings e.g. regarding compiler version/debug level

## TODOs:

- check LIBMANAGEMENT special optimization settings for Linux with debug symbols removed this special handling <https://bugs.openjdk.org/browse/JDK-8351542>
- check LIBVERIFY special optimization settings for Linux with debug symbols, see <https://bugs.openjdk.org/browse/JDK-8352015>
- the lib sizes on AIX are **HUGE** ; this is because we have the debug info stored inside the lib and not separated like on other platforms; it should be possible to separate the debug info on AIX to stabfiles but currently there are issues with tool support
- macOS / clang : try -Oz size optimization (see <https://clang.llvm.org/docs/CommandGuide/clang.html> Code Generation options ) for SIZE => this sometimes leads to slightly smaller libs, but no huge decreases in lib size
- add some measurements with lto (link time optimization) ; this could lead to good results regarding lib-size when gcc is used and HIGHEST is the default optimization level of a lib

| Library        | O-level        | Linux ppc64le    | Linux x86_64     | Linux aarch64    | Macos aarch64    | Macos x86_64     | AIX ppc64        | Windows x86_64      |  |  |  |  |
|----------------|----------------|------------------|------------------|------------------|------------------|------------------|------------------|---------------------|--|--|--|--|
|                |                | gcc 13.2.0 (SAP) | gcc 13.2.0 (SAP) | gcc 13.2.0 (SAP) | XCode 15.4 (SAP) | XCode 15.4 (SAP) | XLC 17.1.2 (SAP) | vs2022 17.6.5 (SAP) |  |  |  |  |
| LIBNET         | <b>LOW</b>     | 84K              | 64K              | 84K              | 100K             | 76K              | 440K             | 52K                 |  |  |  |  |
|                | HIGHEST        | 148K             | 64K              | 84K              | 116K             | 76K              | 444K             | 56K                 |  |  |  |  |
|                | SIZE           | 88K              | 56K              | 84K              | 100K             | 72K              | 412K             | 52K                 |  |  |  |  |
| LIBNIO         | <b>HIGH</b>    | 164K             | 108K             | 160K             | 128K             | 96K              | 704K             | 76K                 |  |  |  |  |
|                | HIGHEST        | 164K             | 108K             | 160K             | 128K             | 96K              | 704K             | 84K                 |  |  |  |  |
|                | SIZE           | 168K             | 96K              | 160K             | 132K             | 92K              | 684K             | 76K                 |  |  |  |  |
| LIBOSXSECURITY | <b>LOW</b>     |                  |                  |                  | 80K              | 52K              |                  |                     |  |  |  |  |
|                | HIGHEST        |                  |                  |                  | 80K              | 52K              |                  |                     |  |  |  |  |
|                | SIZE           |                  |                  |                  | 80K              | 52K              |                  |                     |  |  |  |  |
| LIBJSIG        | <b>LOW</b>     | 76K              | 16K              | 76K              | 76K              | 40K              | 28K              |                     |  |  |  |  |
|                | HIGHEST        | 76K              | 16K              | 76K              | 76K              | 40K              | 28K              |                     |  |  |  |  |
|                | SIZE           | 76K              | 16K              | 76K              | 76K              | 40K              | 28K              |                     |  |  |  |  |
| LIBVERIFY      | <b>HIGH*</b>   | 80K              | 68K              | 76K              | 108K             | 76K              | 292K             | 48K                 |  |  |  |  |
|                | HIGHEST        | 80K              | 68K              | 76K              | 108K             | 76K              | 292K             | 56K                 |  |  |  |  |
|                | SIZE           | 80K              | 68K              | 76K              | 92K              | 68K              | 224K             | 48K                 |  |  |  |  |
| LIBZIP         | <b>LOW</b>     | 80K              | 48K              | 80K              | 164K             | 60K              | 472K             | 76K                 |  |  |  |  |
|                | HIGHEST        | 80K              | 44K              | 80K              | 164K             | 60K              | 480K             | 84K                 |  |  |  |  |
|                | SIZE           | 80K              | 44K              | 80K              | 148K             | 60K              | 376K             | 76K                 |  |  |  |  |
| LIBJAVA        | <b>HIGH</b>    | 252K             | 172K             | 236K             | 188K             | 160K             | 1.5M             | 108K                |  |  |  |  |
|                | HIGHEST        | 252K             | 172K             | 236K             | 188K             | 160K             | 1.5M             | 124K                |  |  |  |  |
|                | SIZE           | 256K             | 160K             | 172K             | 188K             | 152K             | 1.5M             | 108K                |  |  |  |  |
| LIBJIMAGE      | <b>LOW</b>     | 228K             | 156K             | 164K             | 80K              | 56K              | 192K             | 28K                 |  |  |  |  |
|                | HIGHEST        | 228K             | 160K             | 164K             | 80K              | 56K              | 192K             | 32K                 |  |  |  |  |
|                | SIZE           | 228K             | 156K             | 164K             | 80K              | 52K              | 172K             | 28K                 |  |  |  |  |
| LIBJLI         | <b>HIGH</b>    | 152K             | 76K              | 84K              | 152K             | 92K              |                  | 80K                 |  |  |  |  |
|                | HIGHEST        | 152K             | 76K              | 84K              | 152K             | 92K              |                  | 88K                 |  |  |  |  |
|                | SIZE           | 92K              | 64K              | 84K              | 136K             | 88K              |                  | 80K                 |  |  |  |  |
| LIBJSOUND      | <b>LOW</b>     | 164K             | 84K              | 92K              | 140K             | 108K             |                  | 56K                 |  |  |  |  |
|                | HIGHEST        | 164K             | 152K             | 156K             | 136K             | 108K             |                  | 76K                 |  |  |  |  |
|                | SIZE           | 168K             | 76K              | 92K              | 124K             | 88K              |                  | 56K                 |  |  |  |  |
| LIBOSXAPP      | <b>LOW</b>     |                  |                  |                  | 192K             | 164K             |                  |                     |  |  |  |  |
|                | HIGHEST        |                  |                  |                  | 192K             | 164K             |                  |                     |  |  |  |  |
|                | SIZE           |                  |                  |                  | 192K             | 160K             |                  |                     |  |  |  |  |
| LIBOSX         | <b>LOW</b>     |                  |                  |                  | 80K              | 48K              |                  |                     |  |  |  |  |
|                | HIGHEST        |                  |                  |                  | 80K              | 48K              |                  |                     |  |  |  |  |
|                | SIZE           |                  |                  |                  | 80K              | 48K              |                  |                     |  |  |  |  |
| LIBAWT         | <b>HIGHEST</b> | 1.1M             | 876K             | 812K             | 528K             | 620K             | 5.1M             | 1.4M                |  |  |  |  |
|                | SIZE           | 688K             | 624K             | 620K             | 464K             | 500K             | 4.4M             | 1.3M                |  |  |  |  |

|                     |                |      |      |      |      |      |      |      |  |  |  |  |  |
|---------------------|----------------|------|------|------|------|------|------|------|--|--|--|--|--|
| LIBAWT_HEADLESS     | <b>LOW</b>     | 80K  | 48K  | 80K  |      |      | 284K |      |  |  |  |  |  |
|                     | HIGHEST        | 80K  | 48K  | 80K  |      |      | 284K |      |  |  |  |  |  |
|                     | SIZE           | 84K  | 44K  | 80K  |      |      | 284K |      |  |  |  |  |  |
| LIBAWT_XAWT         | <b>LOW</b>     | 756K | 540K | 616K |      |      | 3.0M |      |  |  |  |  |  |
|                     | HIGHEST        | 756K | 556K | 612K |      |      | 3.0M |      |  |  |  |  |  |
|                     | SIZE           | 632K | 480K | 552K |      |      | 2.8M |      |  |  |  |  |  |
| LIBAWT_LWAWT        | <b>LOW</b>     |      |      |      | 1.2M | 1.2M |      |      |  |  |  |  |  |
|                     | HIGHEST        |      |      |      | 1.2M | 1.2M |      |      |  |  |  |  |  |
|                     | SIZE           |      |      |      | 1.2M | 1.2M |      |      |  |  |  |  |  |
| LIBJAWT             | <b>LOW</b>     | 72K  | 8K   | 76K  | 56K  | 32K  | 20K  | 12K  |  |  |  |  |  |
|                     | HIGHEST        | 72K  | 8K   | 76K  | 56K  | 32K  | 20K  | 12K  |  |  |  |  |  |
|                     | SIZE           | 72K  | 8K   | 76K  | 56K  | 32K  | 20K  | 12K  |  |  |  |  |  |
| LIBJAVAJPEG         | <b>HIGHEST</b> | 344K | 236K | 284K | 264K | 240K | 1.4M | 172K |  |  |  |  |  |
|                     | SIZE           | 220K | 152K | 220K | 200K | 168K | 1.1M | 132K |  |  |  |  |  |
| LIBFREETYPE         | <b>HIGHEST</b> | 976K | 732K | 720K | 636K | 636K | 5.4M | 528K |  |  |  |  |  |
|                     | SIZE           | 664K | 572K | 596K | 544K | 532K | 4.8M | 448K |  |  |  |  |  |
| LIBSPLASHSCREEN     | <b>SIZE</b>    | 376K | 300K | 368K | 404K | 316K | 1.5M | 208K |  |  |  |  |  |
|                     | HIGHEST        | 628K | 464K | 432K | 500K | 424K | 1.9M | 248K |  |  |  |  |  |
| LIBOSXUI            | <b>LOW</b>     |      |      |      | 104K | 68K  |      |      |  |  |  |  |  |
|                     | HIGHEST        |      |      |      | 100K | 68K  |      |      |  |  |  |  |  |
|                     | SIZE           |      |      |      | 104K | 64K  |      |      |  |  |  |  |  |
| LIBINSTRUMENT       | <b>LOW</b>     | 80K  | 56K  | 80K  | 96K  | 72K  | 552K | 48K  |  |  |  |  |  |
|                     | HIGHEST        | 80K  | 60K  | 80K  | 112K | 72K  | 556K | 52K  |  |  |  |  |  |
|                     | SIZE           | 84K  | 52K  | 80K  | 96K  | 72K  | 512K | 48K  |  |  |  |  |  |
| LIBMANAGEMENT       | <b>HIGH*</b>   | 80K  | 32K  | 80K  | 80K  | 48K  | 232K | 20K  |  |  |  |  |  |
|                     | HIGHEST        | 80K  | 32K  | 80K  | 80K  | 48K  | 232K | 20K  |  |  |  |  |  |
|                     | SIZE           | 80K  | 32K  | 80K  | 80K  | 48K  | 232K | 20K  |  |  |  |  |  |
| LIBPREFS            | <b>HIGH</b>    | 76K  | 12K  | 76K  | 80K  | 48K  | 32K  | 16K  |  |  |  |  |  |
|                     | HIGHEST        | 76K  | 12K  | 76K  | 80K  | 48K  | 32K  | 16K  |  |  |  |  |  |
|                     | SIZE           | 76K  | 8K   | 76K  | 80K  | 48K  | 32K  | 16K  |  |  |  |  |  |
| LIBRMI              | <b>LOW</b>     | 72K  | 8K   | 76K  | 72K  | 36K  | 20K  | 12K  |  |  |  |  |  |
|                     | HIGHEST        | 72K  | 8K   | 76K  | 72K  | 36K  | 20K  | 12K  |  |  |  |  |  |
|                     | SIZE           | 72K  | 8K   | 76K  | 72K  | 36K  | 20K  | 12K  |  |  |  |  |  |
| LIBJ2GSS            | <b>LOW</b>     | 80K  | 56K  | 80K  | 96K  | 72K  | 184K | 48K  |  |  |  |  |  |
|                     | HIGHEST        | 80K  | 56K  | 80K  | 96K  | 72K  | 184K | 48K  |  |  |  |  |  |
|                     | SIZE           | 84K  | 52K  | 80K  | 96K  | 68K  | 176K | 48K  |  |  |  |  |  |
| LIBSSPI_BRIDGE      | <b>LOW</b>     |      |      |      |      |      |      | 40K  |  |  |  |  |  |
|                     | HIGHEST        |      |      |      |      |      |      | 44K  |  |  |  |  |  |
|                     | SIZE           |      |      |      |      |      |      | 40K  |  |  |  |  |  |
| LIBW2K_LSA_AUTH     | <b>LOW</b>     |      |      |      |      |      |      | 28K  |  |  |  |  |  |
|                     | HIGHEST        |      |      |      |      |      |      | 28K  |  |  |  |  |  |
|                     | SIZE           |      |      |      |      |      |      | 28K  |  |  |  |  |  |
| LIBOSXKRB5          | <b>LOW</b>     |      |      |      | 80K  | 52K  |      |      |  |  |  |  |  |
|                     | HIGHEST        |      |      |      | 76K  | 52K  |      |      |  |  |  |  |  |
|                     | SIZE           |      |      |      | 80K  | 52K  |      |      |  |  |  |  |  |
| LIBJ2PCSC           | <b>LOW</b>     | 76K  | 20K  | 76K  | 76K  | 44K  | 92K  | 16K  |  |  |  |  |  |
|                     | HIGHEST        | 76K  | 20K  | 76K  | 76K  | 44K  | 92K  | 16K  |  |  |  |  |  |
|                     | SIZE           | 76K  | 20K  | 76K  | 76K  | 44K  | 80K  | 16K  |  |  |  |  |  |
| LIBJAVAACCESSBRIDGE | <b>LOW</b>     |      |      |      |      |      |      | 296K |  |  |  |  |  |
|                     | HIGHEST        |      |      |      |      |      |      | 304K |  |  |  |  |  |
|                     | SIZE           |      |      |      |      |      |      | 296K |  |  |  |  |  |
| LIBATTACH           | <b>LOW</b>     | 76K  | 16K  | 76K  | 76K  | 44K  | 44K  | 20K  |  |  |  |  |  |
|                     | HIGHEST        | 76K  | 16K  | 76K  | 76K  | 44K  | 44K  | 20K  |  |  |  |  |  |
|                     | SIZE           | 76K  | 16K  | 76K  | 76K  | 40K  | 44K  | 20K  |  |  |  |  |  |
| LIBJ2PKCS11         | <b>LOW</b>     | 148K | 100K | 152K | 132K | 108K | 700K | 76K  |  |  |  |  |  |
|                     | HIGHEST        | 148K | 100K | 148K | 132K | 108K | 704K | 84K  |  |  |  |  |  |
|                     | SIZE           | 152K | 88K  | 148K | 132K | 100K | 684K | 76K  |  |  |  |  |  |
| LIBSUNMSCAPI        | <b>LOW</b>     |      |      |      |      |      |      | 44K  |  |  |  |  |  |
|                     | HIGHEST        |      |      |      |      |      |      | 44K  |  |  |  |  |  |
|                     | SIZE           |      |      |      |      |      |      | 44K  |  |  |  |  |  |
| LIBDT_SHMEM         | <b>LOW</b>     |      |      |      |      |      |      | 32K  |  |  |  |  |  |
|                     | HIGHEST        |      |      |      |      |      |      | 36K  |  |  |  |  |  |
|                     | SIZE           |      |      |      |      |      |      | 32K  |  |  |  |  |  |
| LIBDT_SOCKET        | <b>LOW</b>     | 80K  | 32K  | 80K  | 76K  | 52K  | 128K | 32K  |  |  |  |  |  |
|                     | HIGHEST        | 80K  | 36K  | 80K  | 76K  | 52K  | 128K | 36K  |  |  |  |  |  |

|                              |         |      |      |      |      |      |      |      |  |  |  |  |
|------------------------------|---------|------|------|------|------|------|------|------|--|--|--|--|
|                              | SIZE    | 80K  | 32K  | 80K  | 76K  | 48K  | 112K | 32K  |  |  |  |  |
| LIBJDWP                      | LOW     | 428K | 304K | 364K | 312K | 280K | 1.9M | 228K |  |  |  |  |
|                              | HIGHEST | 428K | 316K | 364K | 308K | 288K | 1.9M | 260K |  |  |  |  |
|                              | SIZE    | 368K | 268K | 300K | 296K | 260K | 1.8M | 228K |  |  |  |  |
| LIBPACKAGEAPPLAUN<br>CHERAUX | LOW     |      |      |      |      |      |      |      |  |  |  |  |
|                              | HIGHEST |      |      |      |      |      |      |      |  |  |  |  |
|                              | SIZE    |      |      |      |      |      |      |      |  |  |  |  |
| LIBPACKAGE                   | LOW     |      |      |      |      |      |      | 128K |  |  |  |  |
|                              | HIGHEST |      |      |      |      |      |      | 140K |  |  |  |  |
|                              | SIZE    |      |      |      |      |      |      | 128K |  |  |  |  |
| LIBWIXHELPER                 | LOW     |      |      |      |      |      |      |      |  |  |  |  |
|                              | HIGHEST |      |      |      |      |      |      |      |  |  |  |  |
|                              | SIZE    |      |      |      |      |      |      |      |  |  |  |  |
| LIBMANAGEMENT_AGENT          | LOW     | 72K  | 8K   | 76K  | 72K  | 36K  | 28K  | 16K  |  |  |  |  |
|                              | HIGHEST | 72K  | 8K   | 76K  | 72K  | 36K  | 28K  | 16K  |  |  |  |  |
|                              | SIZE    | 76K  | 8K   | 76K  | 72K  | 36K  | 28K  | 16K  |  |  |  |  |
| LIBMANAGEMENT_EXT            | HIGH*   | 80K  | 40K  | 80K  | 80K  | 52K  | 224K | 32K  |  |  |  |  |
|                              | HIGHEST | 80K  | 40K  | 80K  | 80K  | 52K  | 224K | 32K  |  |  |  |  |
|                              | SIZE    | 80K  | 40K  | 80K  | 80K  | 52K  | 220K | 32K  |  |  |  |  |
| LIBEXTNET                    | LOW     | 76K  | 16K  | 76K  | 76K  | 40K  | 48K  | 16K  |  |  |  |  |
|                              | HIGHEST | 76K  | 20K  | 76K  | 76K  | 40K  | 48K  | 16K  |  |  |  |  |
|                              | SIZE    | 76K  | 16K  | 76K  | 76K  | 40K  | 44K  | 16K  |  |  |  |  |
| LIBSCTP                      | LOW     | 80K  | 32K  | 80K  |      |      |      |      |  |  |  |  |
|                              | HIGHEST | 80K  | 36K  | 80K  |      |      |      |      |  |  |  |  |
|                              | SIZE    | 80K  | 32K  | 80K  |      |      |      |      |  |  |  |  |
| LIBJAAS                      | LOW     | 76K  | 8K   | 76K  | 72K  | 36K  | 32K  | 20K  |  |  |  |  |
|                              | HIGHEST | 76K  | 12K  | 76K  | 72K  | 36K  | 32K  | 20K  |  |  |  |  |
|                              | SIZE    | 76K  | 8K   | 76K  | 72K  | 36K  | 32K  | 20K  |  |  |  |  |