Automatic Binary Optimizer

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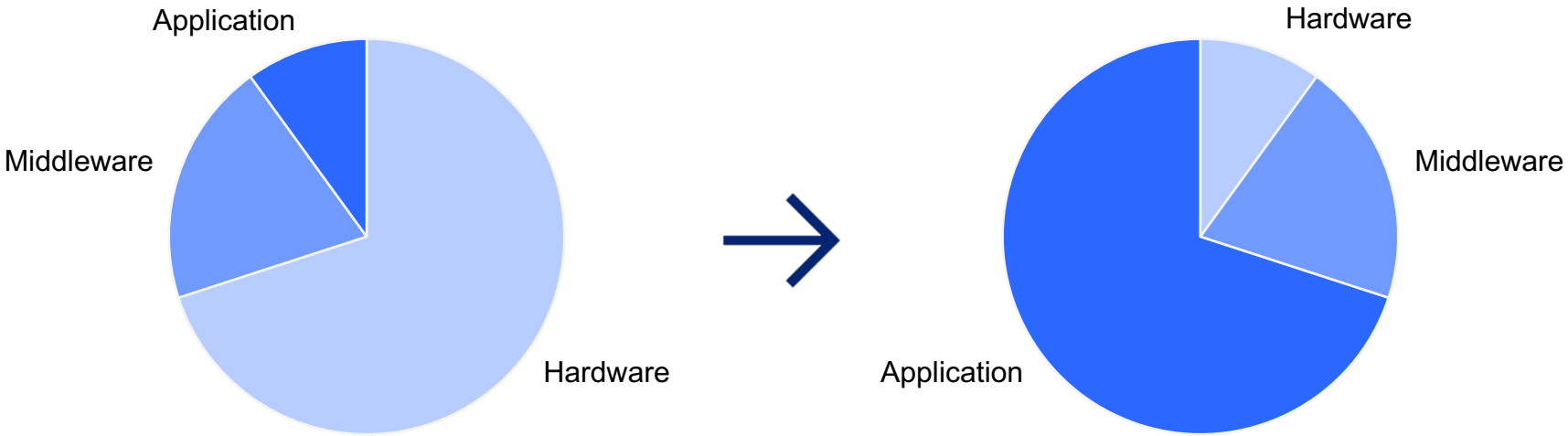
Performance of COBOL applications do not automatically increase on new Z hardware.

Performance on modern IBM Z® hardware is delivered via a combination of hardware features and compiler support.

To improve performance, you'll need to:

- Recompile
- Optimize
- Refactor…



Automatic Binary Optimizer (**ABO**) v2.1

Reduces migration effort to COBOL v6.3 significantly

- **Complements** Enterprise COBOL v6.3
- Reduces migration scope
- Avoids the need to fix problems in existing source due to poor programming practices. For example, invalid data issues

Targets latest Z Systems®:

- **Introduces newer optimization technology** into existing binaries
- Exploits new hardware features designed to improve performance of COBOL applications

On z15 ABO v2.1 **reduces,** on average:

CPU usage of 57% over COBOL v4.2

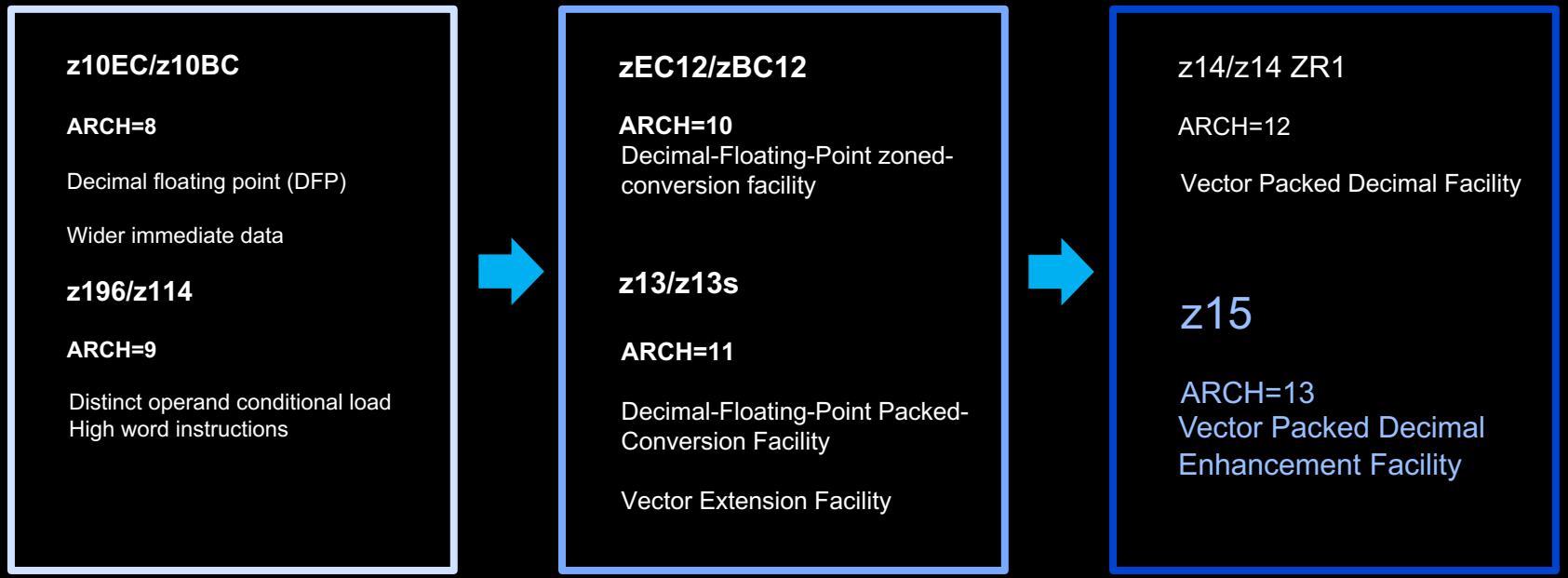
CPU usage of 10% over ABO 1.3

Optimizes load modules compiled with VS COBOL II v1.3 to COBOL v4.2

- Avoids source recompilation
- Significantly reduces testing effort
- Reduces operating costs and increase application efficiency:
  - Lowers CPU usage and processing time

* Performance results shown was obtained in a controlled, isolated environments using IBM internal test suite. Performance of other workloads may vary.

ABO enables hardware performance features



COBOL v4 applications cannot take advantage of these features wasting precious CPU cycles

Complementary technologies

Automatic Binary Optimizer for z/OS 2.1

- Optimizes existing program modules without the need for recompilation
- Increases performance of programs that are not frequently updated

Enterprise COBOL for z/OS 6.3

- Use new language features to modernize critical applications
- Build and optimize performance for programs that are under active development or maintenance

Taking advantage of new hardware features on IBM Z normally requires a recompilation of your applications by migrating to the latest Enterprise COBOL compiler

Most source is not regularly recompiled

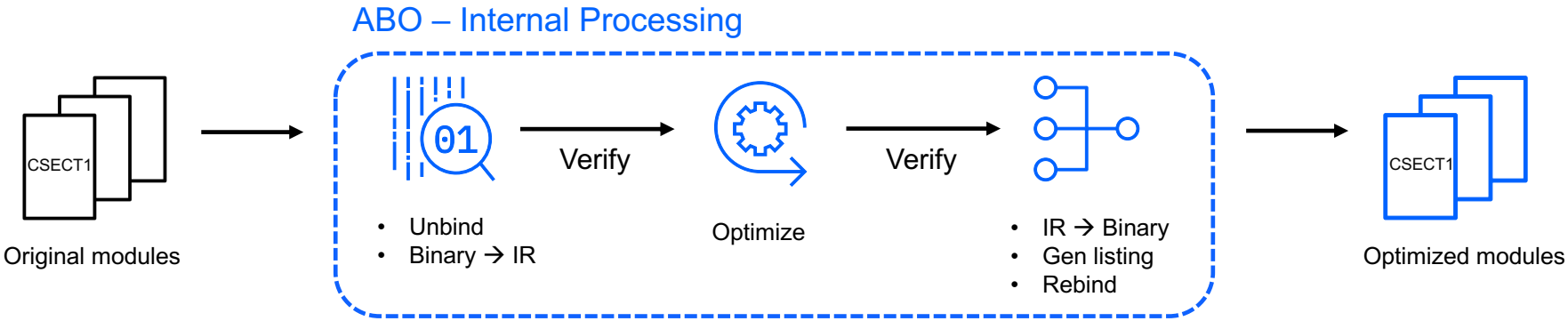
80%

Code runs in production and is not changed over many years

20%

Code is being actively developed and maintained

Automatic Binary Optimizer (ABO) technology overview



- ABO unbinds the original module to create an Intermediate Representation (IR) per optimization-eligible CSECT
- After optimization of all CSECTs in a module, ABO rebinds the modules and produces an optimized module
- Verification process is done every step to ensure internal consistency and correctness

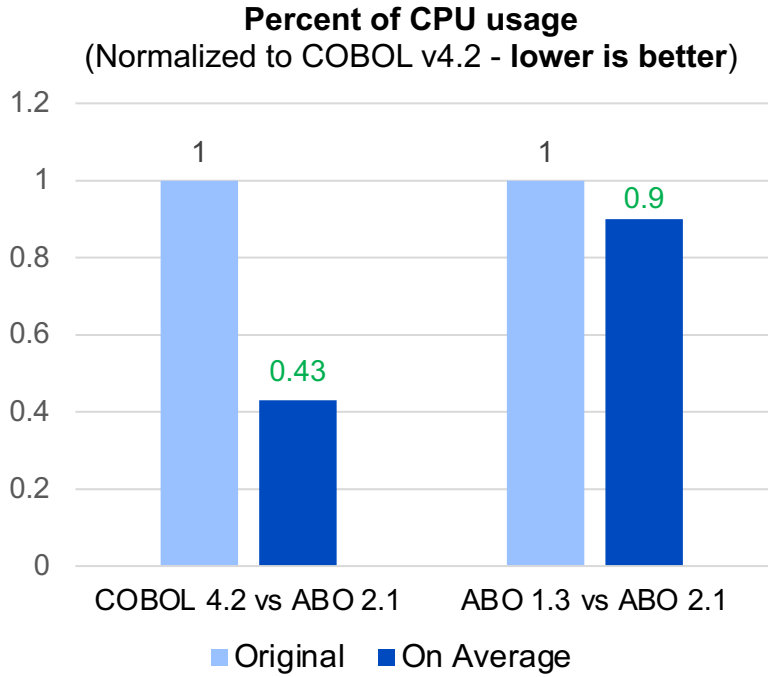
ABO uses robust whole program analysis and verification to achieve significant performance improvement

ABO is not a straightforward one to one substitutions of old for new machine instructions

ABO analyzes the entire program in order to safely optimize the program and maximize the performance improvements

Optimization techniques such as determining the control flow of the program and allocating registers globally naturally requires whole program knowledge

Automatic Binary Optimizer (**ABO**) v2.1 performance on z15



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Link to ABO v2.1performance claim

Exploits full z15® architecture

- Vector Packed Decimal Enhancement Facility
- Reduces CPU usage by up to 22% for COBOL applications encountering decimal overflow conditions while using interlanguage calls
- Optimizes programs built with CMPR2 options in VS COBOL II
- Improves scalability - up to 53% reduction is CPU and 30% reduction in memory usage over ABO v1.3 for large modules

ABO compatibility guarantee by design

Binary as input

ABO consumes the original binary, so the exact behavior of the original program is known.

Unchanged options

No compiler options (performance or otherwise) are changing.

Interoperability

The optimized program looks/behaves as the original program from the outside (but faster!) so no interoperability concerns with other programs.

reduced testing effort vs recompilation/migration

Testing

System verification and performance tests only [1]

If something goes wrong, revert to using original program.

Users can optimize modules in a test environment and then deploy to their production environment.

[1] Although this is IBM's testing recommendation it may vary in practice due to differing customer testing strategies, environments, risk acceptance and method/scope of using ABO

Although the installation and basic use of ABO is simple an ABO evaluation and deployment can be challenging

- Determining applications that are good candidates to show ABO value
- Selecting the top modules to keep an ABO evaluation in scope and focused
- ABO processing time and memory concerns (often from optimizing too many modules)
- Lack of a performance analysis tool and/or the resources and time to use these tools
- Targeting the latest IBM Z system to maximize the ABO performance benefit
- Understanding and interpreting performance results

ABO Assistant is a suite of tools that enables the users to get concrete performance evaluation results from ABO optimization starting from high level SMF data

ABO Assistant is available in the March 2021 PTF level of ABO 2.1

SMF Analyzer

Process the SMF data

Select application programs

Sort programs high to low based on CPU time

Program Analyzer & Optimizer

Identify top CPU consuming COBOL modules

Invoke ABO to optimize

Run the application

Analyze the performance results

Automatic Binary Optimizer for z/OS Trial offers the same features and benefits as the generally available product

Available for z/OS 2.2, z/OS 2.3 and z/OS 2.4

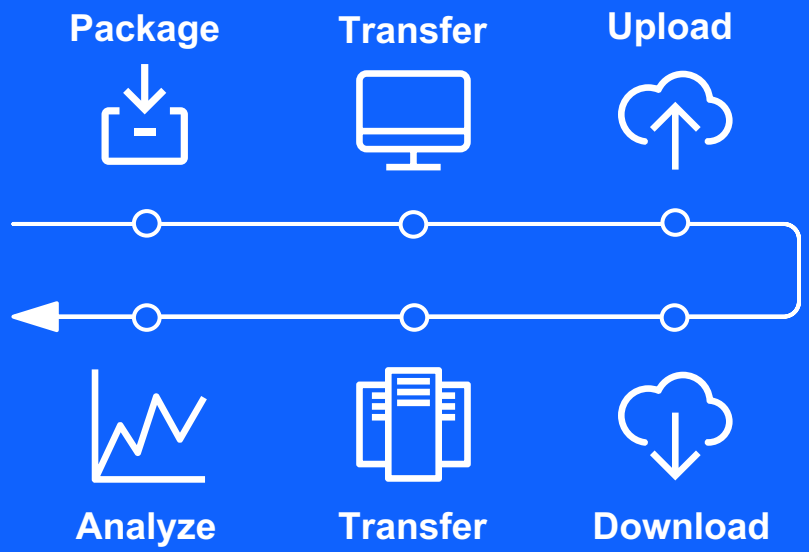
Allows you to assess the value of ABO; however, modules optimized by trials cannot be used in production

90-day evaluation license at no charge

Available as standard offering from IBM through Shopz. Contact your IBM representative for ordering assistance or visit product page for more information - Link

IBM Automatic Binary Optimizer for z/OS Trial Cloud Service

- No-charge 90-day trial web application to optimize COBOL modules
- No installation or setup required on your system
- Brand new design with easy-to-follow instructions and videos to guide users from beginning to end
- Modules optimized by the Trial Cloud Service cannot be used in production



Compiled program (CSECT) eligibility for optimization by ABO

Program module produced by COBOL compiler release	ABO today
OS/VS COBOL	⊘
VS COBOL II V1.3 & V1.4	✓
COBOL/370 1.1 & COBOL for MVS & VM V1R2	✓
COBOL for OS/390 & VM V2R1→V2R2	✓
Enterprise COBOL V3R1 → V3R4	✓
Enterprise COBOL V4R1 → V4R2	✓
Enterprise COBOL V5/V6*	⊘

ABO can optimize modules from a wide range of compilers and IBM intends to expand this scope to include Enterprise COBOL for z/OS v5 and up*

ABO v1.3 and v2.1 can optimize modules produced by these versions of the COBOL compiler

New technology is under development with the intent to extend ABO eligibility to optimizing modules produced by these newer COBOL compilers*

* Subject to change or withdrawal without notice at the sole discretion of IBM.

Automatic Binary Optimizer and Tailored Fit Pricing

(**ABO** and **TFP**)

Sub-Capacity
(R4HA)

Tailored Fit

- TFP is a new consumption-based software pricing model that delivers transparency, and predictability for software expenses
- TFP enables Z clients overcome unpredictable expenses associated with software pricing models based on rolling four-hour average (R4HA)
- ABO reduces CPU consumption of business-critical COBOL applications without recompilation; minimizing testing effort and maximizing return on investment on Z hardware
- TFP charges are based on total MSU consumed annually, reducing CPU consumption of critical COBOL applications, batch and online, help clients optimize production workloads and costs

In summary

1. Innovations on Z enable your digital transformation
2. ABO improves the performance of your COBOL applications and reduces your migration effort
3. Your continued business needs drive innovations on Z

Performance claim

Automatic Binary Optimizer v2.1

The performance improvements are based on internal IBM lab measurements on a z15 system configured as a z/OS V2R3 dedicated LPAR with 1 CP and 32GB Central Storage and a z14 system configured as a z/OS V2R3 dedicated LPAR with 1 CP and 32GB Central Storage. All benchmarks optimized with IBM Automatic Binary Optimizer for z/OS V2.1 used the new ARCH(13) option and default settings for all other options. All benchmarks optimized with IBM Automatic Binary Optimizer for z/OS V1.3 (GA) use ARCH(12) option and default settings for all other options. The input COBOL benchmarks modules optimized by IBM Automatic Binary Optimizer for z/OS were all compiled by Enterprise COBOL V4.2. All benchmarks compiled with Enterprise COBOL V4.2use the compiler option OPT(STD).

The COBOL benchmark application used for claim 3 contained COBOL to Java interlanguage calls.

Performance results for customer applications options specified and other factors.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