Understand, reuse, and manage your critical CICS applications

IBM CICS Interdependency Analyzer for z/OS, Version 6.3

Recent enhancements

- IBM® CICS® Transaction Server 6.3 support
- CICS IA VS Code Extension
- CICS IA Web Application
- Show the command EXEC CICS START with the ATTACH parameter
- Show the command EXEC CICS START with the BREXIT parameter
- Include the PTTRANSID and PTTASKID fields in the command flow report
- ADD HEADER TO COMMAND FLOW CSV FILES
- New or changed commands in CICS IA 6.3 collector

Features

- Business application analysis
- Intuitive plug-in for IBM CICS Explorer®
- Centralized data access using IBM Db2® database
- Ability to see uses and where used relationships
- Powerful query comparison feature
- Advanced program analysis using Command Flow
- Identification of threadsafe and non-threadsafe programs
- Isolation and removal of affinities
- Faster implementation of CICSPlex® SM workload management
- Highlighting of service-enablement candidates
- Cloud application analysis
- Resource use and dependencies by platform
- Visualization of task control block (TCB), region, and application switches
- Dependency collection sampling technique

Benefits

- Gain new insight into your application structure
- Enable informed decision-making
- Optimize CICS resource use
- Accelerate CICS version upgrades
- Support Development and Management processes
- Reduce the time of problem resolution
- Reuse and extend CICS applications quickly and reliably

The power of understanding

To stay competitive in today's rapidly changing market environment, businesses are increasingly adopting new technologies like mobile devices and RESTful web services to help them respond to marketplace changes with increased agility and efficiency. Whatever the technology, you need a flexible and responsive IT infrastructure that lets you change your business quickly and cost-effectively. At the same time, you are under pressure to optimize your IT operations — to improve the performance, availability and reliability of your existing applications, balance increasing workloads and minimize disruption of routine application maintenance to the user.

IBM CICS Interdependency Analyzer for z/OS®

6.3 (CICS IA) is a dynamic discovery tool that helps you understand the relationships, dependencies, and flows of CICS Transaction Server (CICS TS) applications. It gives you the insight to update, modernize, and optimize your applications with confidence.

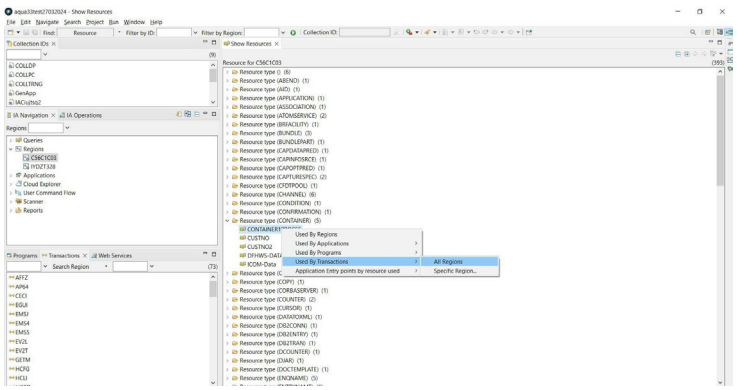

Figure 1 The CICS IA plug-in for CICS Explorer helps you understand application topology.

Features like Command Flow, a flexible query engine with a wide range of built-in analysis queries, and a CICS Explorer plug-in (see Figure 1) make it possible to achieve even better reuse, management, and control of your applications through improved understanding.

CICS IA provides a best-practice approach, helping architects, developers, testers, and system programmers with projects like mobile enablement, CICS version-to-version upgrade, threadsafe analysis, consolidation, workload management, and service

enablement whose success depends on deep knowledge of application, system, and resource relationships.

The latest versions of sub-systems are supported, including CICS TS 6.3, IBM WebSphere® MQ 7.1, IBM Db2 13, and IBM IMS™ 15.

Collecting resource-relationship data

CICS IA automates the detection of runtime relationships among key resources within your CICS system. It records this data in a Db2 database and enables you to analyze the collected information, build a resource-relationship map, and use this data in your daily development and operations management processes.

CICS IA includes several components to collect resource-relationship data (see Figure 2). The *dependency collector* intercepts CICS system commands and commands that can create affinities and records the details of the resources used.

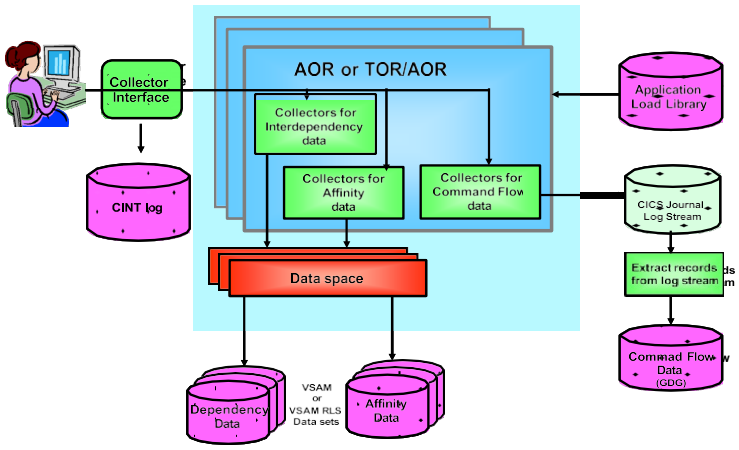

Figure 2 CICS IA data collection architecture

The *scanner* component scans the load-module data sets that show information like the programming language and the CICS commands included in the program. Scanner queries show potential CICS command use, while dependency queries show actual usage. Other queries enable a comparison of potential versus actual API usage, indicating possible dead code or missing test cases.

The *Command Flow* feature captures all CICS, Db2, IMS, and WebSphere MQ commands in chronological order, along with a wide range of related information, including current and previous TCB ID, response and reason codes, times of day, and CSECT offset. With Command Flow, you can see the resources used by a specific instance of a transaction, which is useful for threadsafe analysis and can help you understand the flow and structure of umbrella transactions or application entry points.

The collected data is efficiently stored in an IBM z Systems™ data space to help reduce data-collection overhead (Command Flow data is initially saved to a CICS user journal) and then offloaded to Virtual Storage Access Method (VSAM) files. Under operator control, the VSAM files are aggregated together and stored in a Db2 database.

CICS commands monitored by CICS IA include CICS application programming interface (API), CICS and CICSPlex SM system programming interface (SPI), and CICS Front-End Programming Interface (FEPI) commands. These commands include new and modified commands introduced in the latest release of IBM CICS TS.

CICS IA provides views of dependency and Command Flow data for applications and platforms deployed in a CICS V6 cloud, which can help you build and manage a more dynamic, cloud-enabled CICS environment. Multi-version application support enables fine-grained analysis of rapidly changing mobile applications.

CICS IA can detect *loosely coupled* dependencies between the event source, such as program, queue, or file, and the event along with its *binding* and *capture specification*, which are created when applications generate business events. Plug-in queries can help you see the events that might need to change when, for example, file, table, or queue record structures are modified.

CICS IA captures detailed information about the CICS Global User exits (GLUEs) and CICS task-related user exits (TRUEs). This information enables you to understand the exits used in your environment, which can help you plan your CICS TS upgrades. You can also map the TRUE entry points to more meaningful names. Mappings for several IBM-supplied TRUEs are provided, and customers can supply their own mappings for other vendor-provided and in-house TRUEs, helping you understand the vendor products used in conjunction with your applications.

CICS IA monitors non-CICS commands, including calls to Db2, IMS, and WebSphere MQ resources. Relationship data for ADABAS files used in conjunction with Natural programs can also be collected.

Understanding CICS resource relationships

Consistent use of the CICS IA collectors helps to create a comprehensive online database. You can access the database by using the CICS IA plug-in for CICS

Explorer to gain a better understanding of the following artifacts:

- Selected resources of CICS regions
- Resources used by a transaction, program, or service
- Resources used by applications and platforms in a CICS cloud
- Cross-region applications and dependencies
- The resource topology within a particular CICS region
- Discovered data, such as affinities by region
- Transaction flow for normal and error paths
- Real-time and scanned program attributes
- Impact analysis – closing files, VSAM file recovery, migrating from VSAM to Db2, and so on
- Knowledge of the first time and last time a particular CICS resource command was issued
- Affinities that must be removed when planning for dynamic workload balancing
- Unused resources
- Resources used by different programs
- TCB switching activity for threadsafe analysis
- Dependency resource data by collection ID.

CICS IA builds relationships for program interactions that use the CICS LINK, XCTL, and LOAD commands, native calls using Enterprise COBOL and PL/I languages, plus Software AG Natural fourth-general language. If you use Natural and want to know how your Natural programs relate to ADABAS files and other CICS resources, CICS IA can help you.

CICS IA provides a cross-system view of transaction dependencies, and the Command Flow shows exactly where region switches occur.

In each new release, CICS IA expands the scope of its data capture. For example, CICS IA 6.3 captures CICSPlex SM commands, further enhancing threadsafe analysis.

CICS IA also captures information about any EXEC CICS command with more than one resource associated with it, for example, collecting both the program and channel name when a channel is associated with an EXEC CICS LINK program. In this case, the program is referred to as the primary resource and the channel as the secondary resource. CICS IA maintains information about related resources so that its plug-in for CICS Explorer can present a useful hierarchical view of resource relationships.

Navigating relationships

CICS IA provides two main ways to query collected resource-relationship data online: the plug-in for CICS Explorer, which is built on Eclipse technology, and several sample queries that can be run in batch or by using a Structured Query Language (SQL) interface such as SPUFI. CICS IA also provides some reports that run against the VSAM file (see Figure 3).

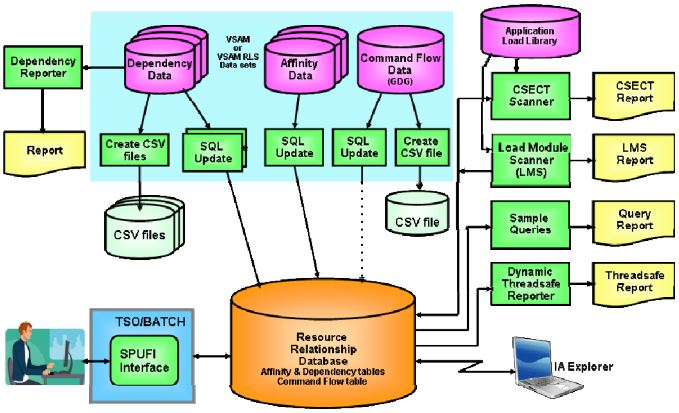

Figure 3 CICS IA reporting architecture

The CICS IA plug-in helps you navigate your CICS resource-relationship data and provides easy-to-use facilities to manage this data and use it in day-to-day analysis. You can interrogate the recorded data to display end-to-end relationships dynamically, such as the files used by a transaction and the functions involved, such as browsing or updating.

The CICS Explorer interface enables point-and-click navigation, making it much easier to follow a sequence of resource relationships. You can also use data filtering provided by the plug-in to help reduce the volume of data displayed so that you can identify the required relationships more easily.

The ability to easily see both *used* and *where-used* relationships is particularly valuable when you change record, table, or message layouts. A simple right-click of the mouse shows you all the programs that use a particular file, allowing you to plan your development activities with confidence.

The plug-in's *graphical visualization* view allows you to see instantly the relationship between your CICS

regions, your applications, your transactions, and your programs. By selecting a platform, application, transaction, or program as a focal point, you can zoom in to see all the resources used by the selected focal point. By filtering by resource type and resource name, you can discover which other regions, platforms, applications, transactions, and programs use the selected resources, as shown in Figure 4.

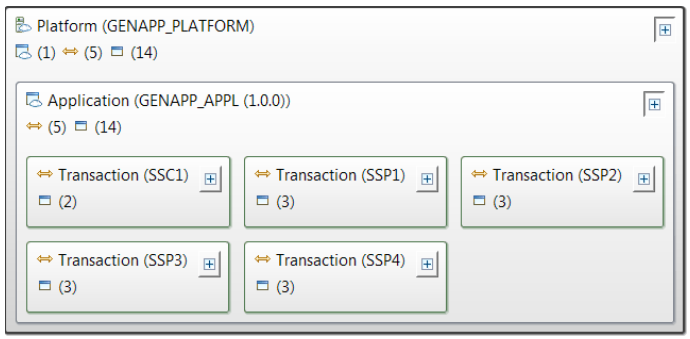

Figure 4 Understand platform and application relationships in the new graphical visualization view

Command Flow data visualization provides more insight into complex application behavior and system state changes. Visual representation of TCB switches, CICS region switches, and CICS V6 application switches can greatly simplify threadsafe, consolidation, and cloud-enablement projects.

Powerful query management

A comprehensive set of SQL queries provided with CICS IA enables you to use the collected data to compare applications across regions or all interdependencies across regions. This capability can help you determine, for example, whether all of an application's required resources are available following migration from a quality-assurance region to a production region.

Queries can include all the resource types collected by the latest level of the CICS Transaction Server. For example, you can collect data to identify all transactions that use a resource type of ‘container.’

A wide range of standard queries are supplied, and you can easily modify these queries or create new ones to meet your individual needs (see Figure 5). You can also create simple or complex folder structures to save your queries.

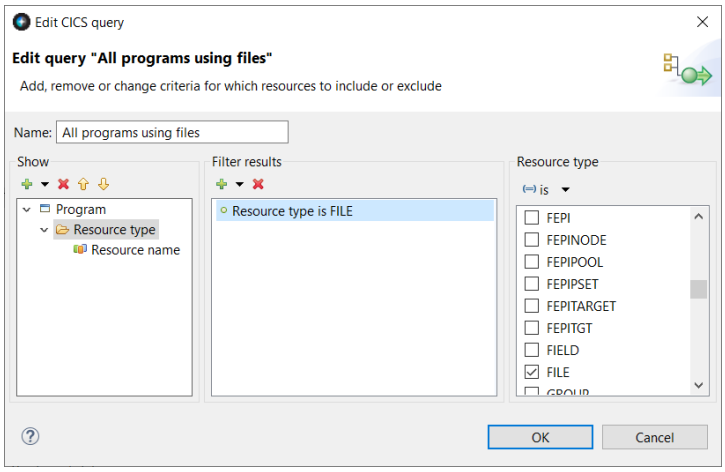

Figure 5 Use the CICS IA plug-in to build and organize your customized queries.

The output from queries can be saved for subsequent analysis or printing. Saved output from two or more queries can also be used in the *query differencing* function. This function automatically compares the output from multiple queries—for example, to show programs that are both threadsafe and affinity-free, to see relationship changes after an updated version of an application is deployed, or to highlight changes following deployment of a new version of an application to ensure that all identified affinities have been removed.

When CICS IA loads dependency data into the database, you can assign it a *collection identifier*, a name or a name and date. Use the collection ID to manage your CICS IA data better and compare data collected for different collection IDs, which is particularly useful if you plan an application upgrade. You can collect data with meaningful collection IDs before and after the change and compare this data.

You can also access resource-relationship data collected in the Db2 database offline by using the CICS IA reporter component to produce a comprehensive, printed report of the dependency information for a selected CICS region.

You can use the CICS IA scanner component to scan the load-module data sets to detect and report the EXEC CICS commands that can cause transaction-resource dependency. Summary or detailed reports about each identified application load-library module are available. In CICS IA, the scanner and the online collectors collect the same attributes, producing a consistent view.

The Program Details plug-in view shows real-time program attributes captured by the dependency collector and CSECT and linkage attributes captured by the scanner.

Controlling data collection

By using an online interface, you can control the status of the CICS IA collectors in all of the enabled CICS regions from one CICS terminal. This capability provides a single control point for configuring CICS IA options for each region. You can turn data collection for multiple CICS regions on and off, or pause it with a single CINT command to speed selection. This capability helps eliminate the need to edit all CICS regions by using the configuration menus to select the resources to be collected.

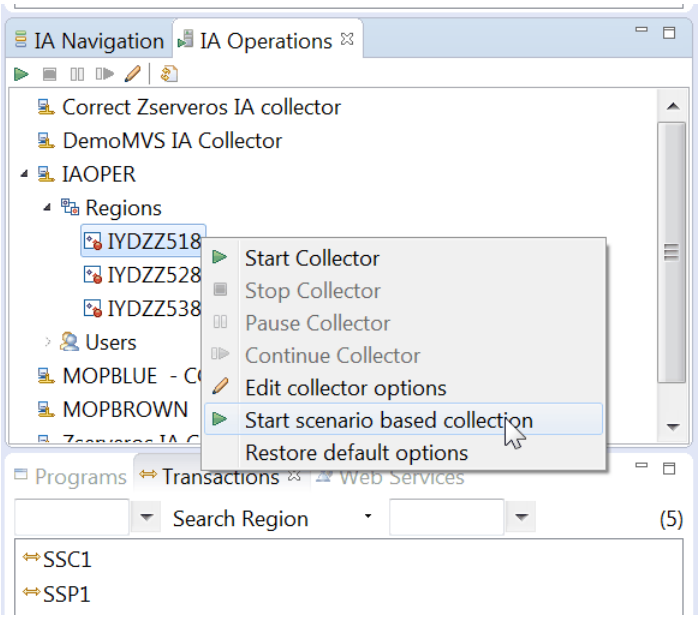

Figure 6 Control Command Flow operations by using the plug-in

Command Flow control operations, for example, to start and stop flow tracing (see Figure 6), can be driven directly from the *IA Operations* view in the CICS IA plug-in when used with a CICS Atom service. The CICS 3270 interface can also be used to drive the CINT and Command Flow control transactions, CINC.

CICS IA provides a timer-based control capability to set the data collector to start at a given time of day to fit your schedule. For example, you can set the control to collect data at critical times, such as at year-end, or to avoid the risk of affecting performance at times of highest workload. You can also choose to set the data collector to collect data for a particular region for one hour of the day and then for another region for the next hour.

CICS IA also enables you to exclude defined programs and transactions from data collection. This exclusion capability means that data is collected only for programs and transactions that you choose, eliminating extraneous data and reducing overhead during data capture.

A new variable sampling option has been added to the Dependency collection. This technique has been introduced to help reduce the CPU overhead by up to 75% while collecting data. This technique can be applied to production regions to balance the impact of collection, the fidelity of the data collected, and production throughput.

CICS IA can also help to manage the life cycle of dependency data, allowing users to compare the behavior of different versions of CICS applications and manage space utilization more easily. Users can identify dependency data using the CICS IA collection ID or the CICS TS application ID and purge redundant data from Db2.

Scenario: Mobile-enabling applications

CICS IA provides invaluable assistance when you need to service-enable your applications for mobile or web access. Supplied queries identify existing programs that are candidates for hosting as web services; for example, programs that are called with a communication area (COMMAREA) or channel, or programs without presentation logic. CICS IA captures resource information for EXEC CICS commands that are considered to be presentation logic.

Multi-version application support can help you understand the different dependencies of multiple levels of rapidly changing mobile applications.

CICS IA also captures key resource information for CICS web services — the program name, URIMAP, container, pipeline, mapping levels, Web Services Description Language (WSDL) file name, and WSBIND file name — all of which enable you to understand which resources are required when deploying web services from development into test, and from test into production.

Scenario: Lost documentation

CICS systems have supported business growth for decades. Over time, a variety of application development techniques and deployment methods have been used to make application and system changes. However, the documentation and even the source code for these applications might no longer be available or, in the case of packaged applications, you might never have had the detailed documentation that you now require.

Even if the documentation and source code are available, it can still be difficult to investigate CICS resource relationships manually because of project schedule constraints, after a merger or an acquisition, or when new people join the team.

With CICS IA, you can quickly understand the structure, flow, interactions, and relationships of poorly documented applications and reconstruct some of the lost documentation, reducing the time and the risk of errors during maintenance.

Scenario: Threadsafe analysis

It has been shown that running CICS applications as threadsafe can save as much as 15 % of processor usage. CICS IA includes a Db2 table that indicates, by CICS version, which APIs and SPIs are considered to be threadsafe (that is, they do not perform a swap to the quasi-reentrant TCB).

The CICS IA threadsafe table, along with detailed information about programs and files, is used by the plug-in query engine (as shown in Figure 7) and the batch reporter to produce a report that provides information, including counts and details of threadsafe and non-threadsafe calls.

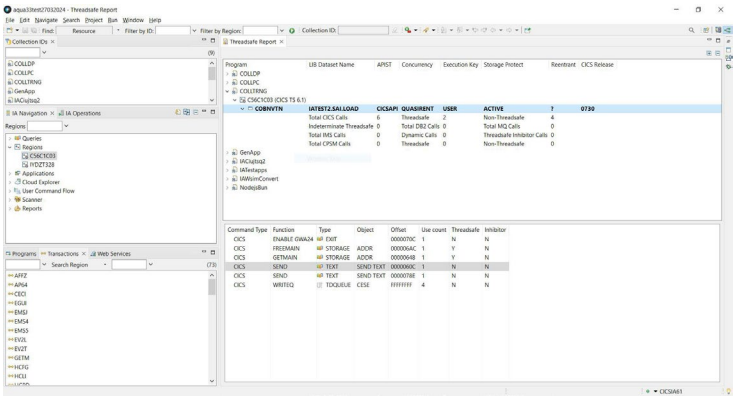

Figure 7 CICS threadsafe information provided by the plug-in

Command Flow provides even more information to help with threadsafe analysis, showing the specific TCB each command runs on and whether a TCB switch was required before or after the command.

The plug-in can generate the threadsafe readiness report, which includes a summary report for all programs in a region and a detailed report for each program. Summary reports include the count of threadsafe commands and non-threadsafe commands, as well as other vital information required for threadsafe analysis.

CICS IA detects non-threadsafe CICSPlex SM API commands and records if the connection uses TCP/IP when an application accesses a remote resource. The scanner also captures whether the load module is re-entrant, which is a pre-requisite for being threadsafe. When CICS IA is used in conjunction with CICS Performance Analyzer (CICS PA) and its plug-in for CICS Explorer, users can navigate in context very easily between the two products. For example, when looking at a CICS PA view that shows transactions with large numbers of TCB switches, a simple right-click can show the program structure and detailed TCB switch activity for selected transactions.

CICS IA provides the most comprehensive analysis of threadsafe attributes, giving you the information you need to assess and modify applications and remove constraints to improve performance.

Scenario: Workload optimization

CICS workload management provides the scalability and resilience required to support mobile users' potentially explosive demands. CICS IA analyzes and helps remove the inter-transaction and transaction-system affinities that can hinder effective workload management.

By using information gathered by CICS IA, you can make better-informed decisions to split or consolidate application workloads efficiently. You can even automatically generate and deploy affinity groups into CICSPlex System Manager by using the plug-in, which can save you time and reduce the chance of transcription errors.

CICS IA can help you to build more flexible CICS systems, balance workloads across IBM CICSplex and IBM Parallel Sysplex® systems, and adapt to the fluid conditions inherent in agile business today.

Scenario: Maintaining business applications

With CICS IA, you can associate key programs and transactions with a business application—for example, Order Entry—and run queries to show all of the resources actually used by the application. Analyzing the relationships at the business application level helps by providing a view of the big picture, such as if you need to deploy the application elsewhere. CICS IA can also use the CICS application name to provide a more consistent view of the business application relationships.

The collected data can help identify resource relationships within your CICS systems. System managers can use this information to maintain the integrity of your CICS systems, to enhance the

Performance of your business applications, and to plan application changes, such as migrating to new servers, performing CICS version-to-version upgrades, or service-enabling your core applications.

Scenario: Event life-cycle

CICS TS 4.1 introduced the ability to generate business events when specific actions occurred to named CICS resources, for example, when a new customer order with a high purchase value is inserted into the CUSTORD file. The event specification is created non-invasively using the Event Wizard in the CICS Explorer. With CICS IA, you can open the Event Wizard in context by right-clicking a CICS resource in any of the CICS IA views, which preloads the wizard with key *capture point* and *filter* details like the resource name, the CICS command, and the name of the invoking transaction and program.

If, over time, it becomes necessary to modify the record structure of the CUSTORD file - for example, to include a customer email address - a CICS IA query can be used to determine which business events will need to be changed. After you have changed the event specification, you must also change the downstream consumers of the event.

Scenario: Mixed-workload applications

Applications can be an IT organization's biggest asset. Reusing application constructs helps accelerate application development through the lifecycle by requiring less new code and reusing previously tested code. If you are developing new web service applications and you want to reuse your current CICS assets, using CICS IA with IBM Rational® Asset Analyzer can help speed your time-to-market.

You can maintain, extend, and transform existing applications through rapid application understanding and impact analysis. Because Rational Asset Analyzer can present complex applications in a visual format, applications are easier to understand.

The CICS IA plug-in lets you launch the Rational Asset Analyzer web interface in context. For example, if CICS IA has identified candidate programs for refactoring as web services, you can link automatically to the Rational Asset Analyzer views for these programs, saving you time.

Summary

Information provided by CICS IA can help you improve the availability of your CICS applications, reduce the cost and increase the speed of CICS application maintenance, change, release, and incident management.

If you are running CICS systems without the information provided by CICS IA, it can be challenging to perform tasks such as splitting workloads across multiple CICS regions to improve availability or identifying which resources are affected by an application change, making programs threadsafe, or refactoring them as web services.

A deep understanding of runtime resource usage and application behavior can also support auditing and governance initiatives.

CICS Tools — your pathway to success

CICS Interdependency Analyzer is one of the five core foundational CICS tools that exploit and augment the latest operational efficiency, service agility, and cloud enhancements in CICS TS 6.3 to give you a service delivery platform for the mobile era.

CICS Tools can help you to optimize your CICS resources achieve greater capacity and improve the availability of your critical enterprise systems. The powerful automation capabilities of CICS Tools can speed service delivery, improve standardization, and reduce risk, whereas rich discovery, advanced visualization, and comprehensive reporting provide the insight you need to ensure that your applications run smoothly and changes are efficient and reliable.

For more information

To learn more about IBM CICS Interdependency Analyzer for z/OS, contact your IBM representative or IBM Business Partner, for Hardware and software requirements for the component products refer **System Requirements**.

To learn more about other IBM CICS Tools, go to:
https://developer.ibm.com/components/cics/

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