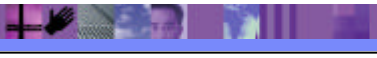
IBM Software Group

CICS On-line Transmission Time Optimizer

Technical Overview

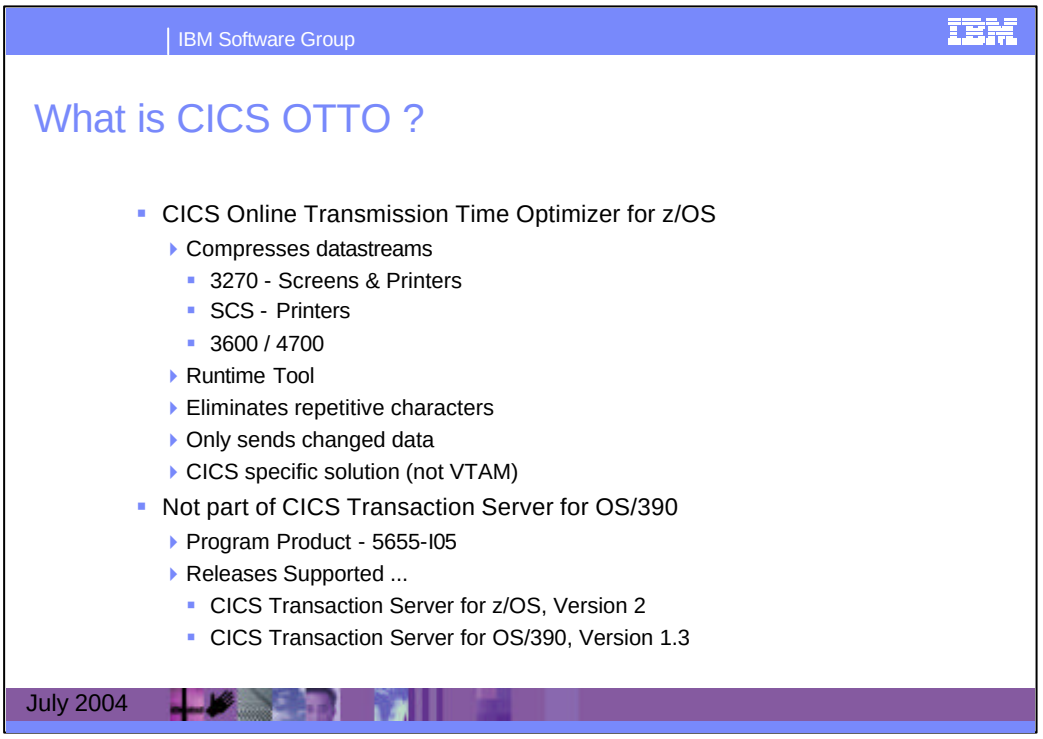
business on demand.

Preface



Agenda

- Overview - CICS Online Transmission Time Optimiser for z/OS
  - Optimization Techniques
    - 3270 Devices
    - SCS Printers
    - 3600/4700 Series Banking Terminals
  - Controlling Optimization
  - Operating OTTO
  - Trace
  - How can OTTO optimization results be observed
  - Summary



CICS Online Transmission Time Optimizer for z/OS (CICS OTTO) improves end-user productivity and increases network utilization through 3270 data stream optimization by:

- Examining outgoing data streams and dynamically compressing them
- Eliminating repetitive characters
    - 20% to 25% of all characters are typically repetitive
- Ensuring that only changed data is sent to the terminals
- Optimizing messages to increase printer speed
- Enabling exclusion and inclusion of terminals dynamically
- Operating transparently to users and applications
- Providing an optional exit for you to change the data stream in the optimized message
- Monitoring its own operation

IBM CICS OTTO improves 3270 network resources utilization and response time and increases end-user productivity by identifying and removing repetitive data and compressing 3270 data streams. CICS OTTO operates efficiently and transparently to applications and users and supports both, local and remote users.

Why would I want CICS OTTO ?

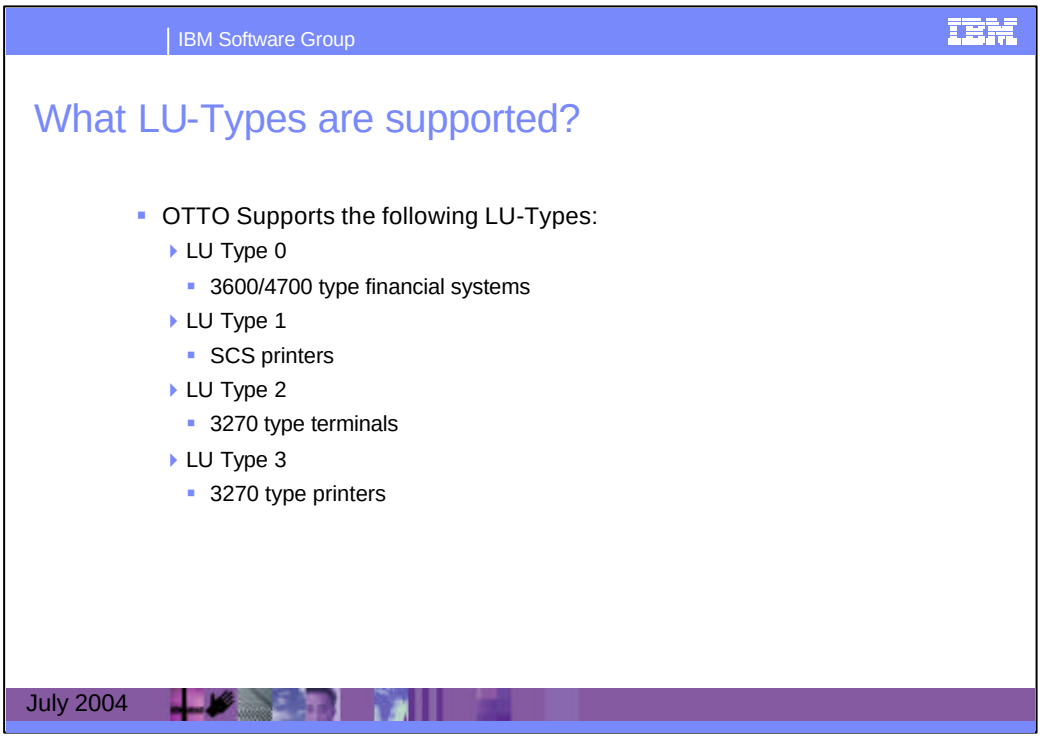
- Better line utilisation
- Less costs for network equipment
- Less costs for data transmission
- Better response times & printer speeds

Depending on your internal requirements, by using CICS OTTO you can :

- Reduce the frequency of communication bottlenecks. This may eliminate the need for new communication equipment (lines, modems, controllers).

- Add more terminal activity on existing communication lines.

- Realize improved response times for terminals on existing communication lines.



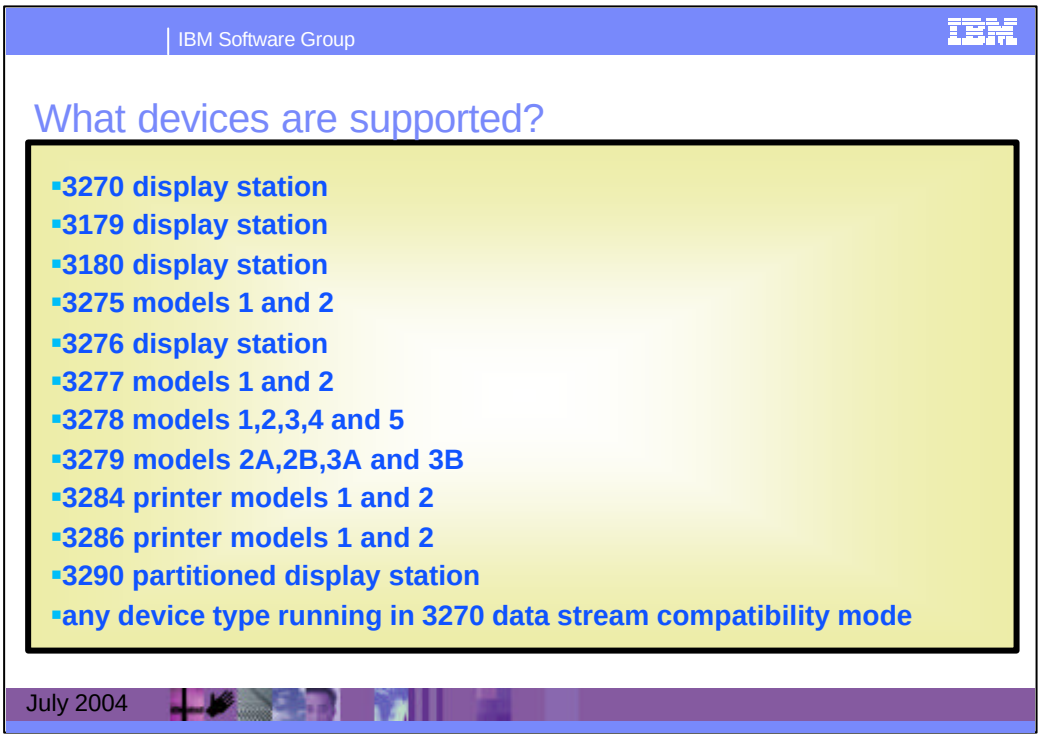
CICS Online Transmission Time Optimizer for z/OS operates on any hardware supporting CICS/ESA V4.1, CICS Transaction Server for

OS/390 V1, or CICS Transaction Server for z/OS V2. CICS Online Transmission Time Optimizer supports both local and remote devices using the VTAM/SDLC protocol.

Devices connected via ACF/TCAM do so through TCAM's Subsystem Interface (SSI), and appear to CICS as if they are using one of the valid VTAM protocols.

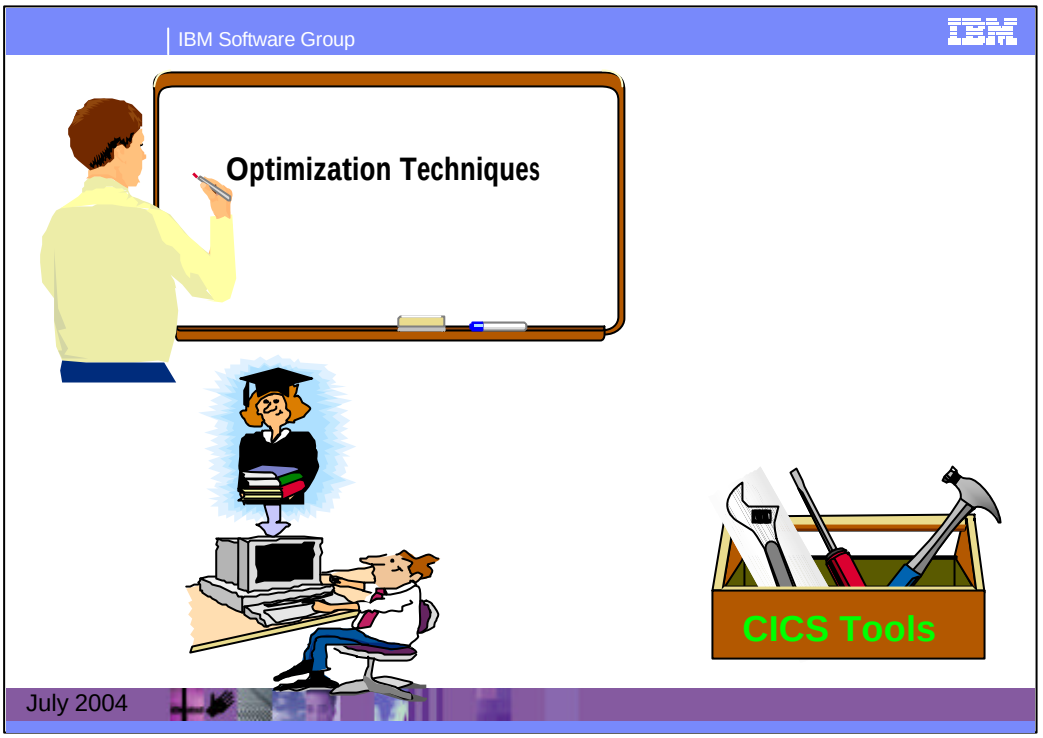
CICS Online Transmission Time Optimizer supports the following IBM Logical Unit (LU) types:

- LU type 0 — 3600/4700-type financial systems
- LU type 1 — SCS printers
- LU type 2 — 3270-type terminals
- LU type 3 — 3270-type printers

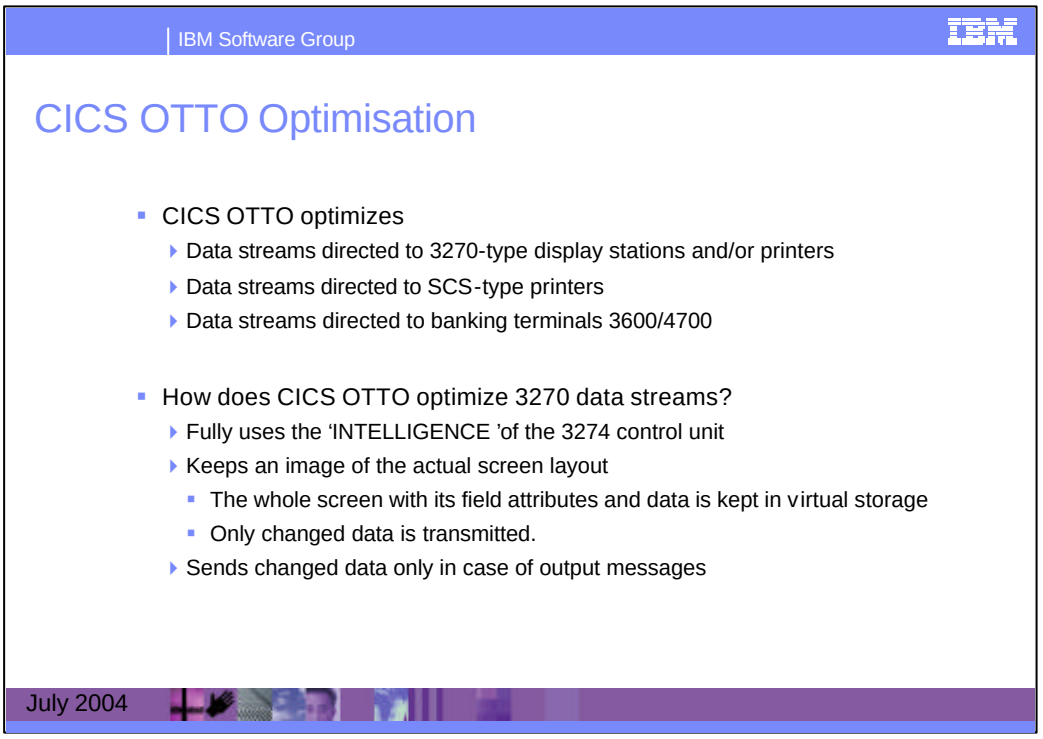


These are the IBM device types supported.

CICS Online Transmission Time Optimizer also supports other non IBM devices that are compatible with the terminals listed above. To be supported, these terminals must recognize standard 3270 hardware order streams and not object to String Control Byte (SCB) compression.



CICS OTTO uses basic optimization techniques (replacing repeating characters, sorting the data stream by buffer addresses) for terminals, and printers as well, and a more advanced technique (imaging) for terminals, only.



3270 Optimization Techniques

The 3270 component is divided into terminals and printers, referred to as logical units (LUs).

Generally, optimization is done according to the 3270 data stream conventions using the intelligence of connected cluster controllers and/or terminals. This is done by the following basic optimization techniques:

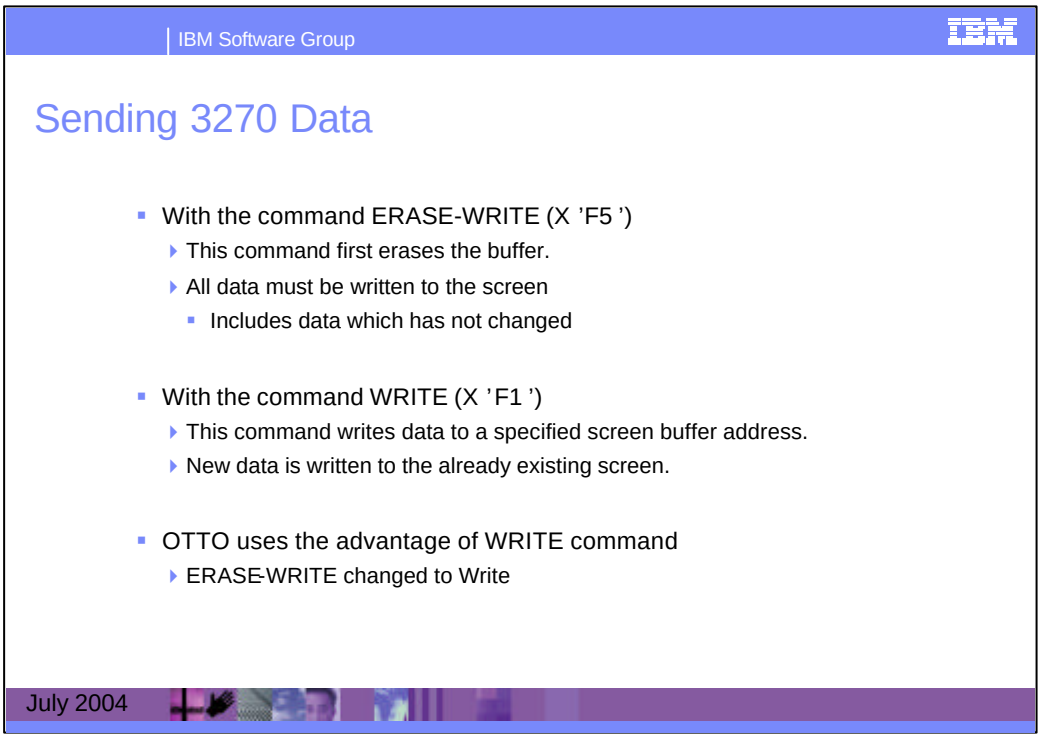
· Replacing repeating characters by an RA-order **(**Repeat to Address).

· Sorting the data stream by buffer addresses.

These techniques are used for terminals as well as for printers with a defined line length in the WCC **(**Write Control Character). For printers without defined line length, blanks followed by a NL **(**New Line) order are eliminated. Additionally, spaces at the end of the line (without NL) are optimized. You can also handle such data streams as if the line length were defined using the WCC-IGNORE option.

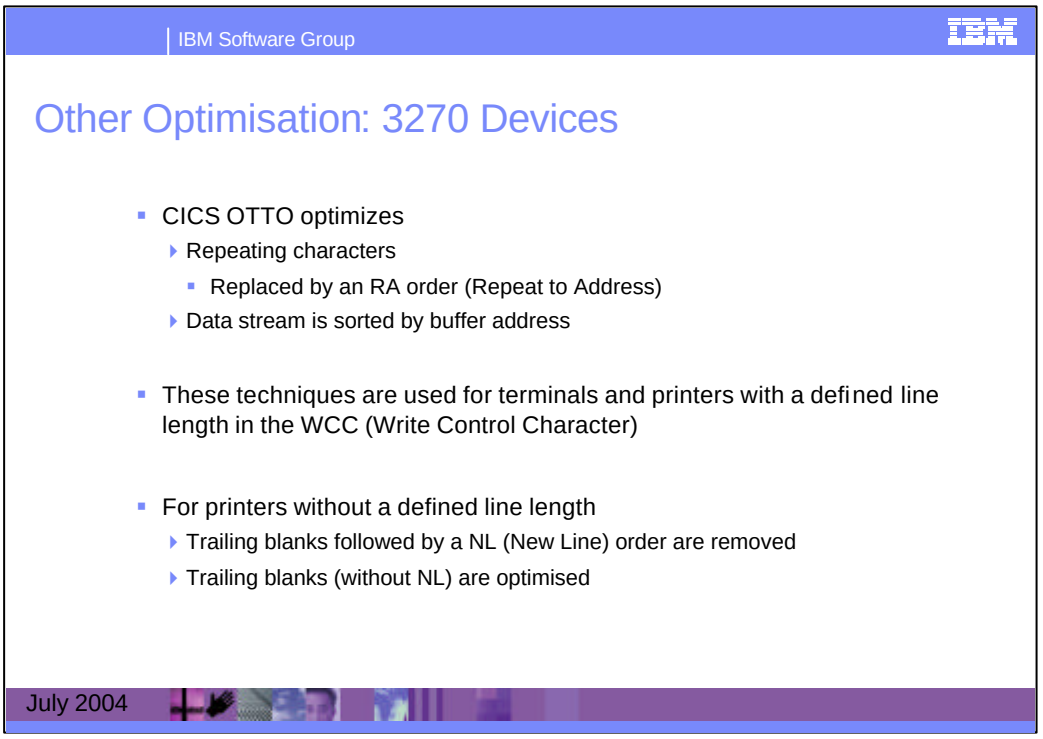
In addition to these basic optimization techniques, Imaging is provided for 3270 terminals.

Imaging is an optimization technique that keeps a copy of a screen in main storage and transmits only changed data. CICS OTTO uses an image pool to do this.



Imaging starts with the first outbound message that is written by the application with an ERASE/WRITE command. All of the subsequent messages destined for the terminal are compared with the existing data in the screen image and only changed data and attributes are transmitted after the optimization process. Simultaneously, the screen image is updated with the new data and attributes.

The Imaging technique leads to a high optimization ratio if terminal operators are using applications that always send the same screen, or at least the same headings and constants. If you use Imaging, the following additional optimization techniques may be used.



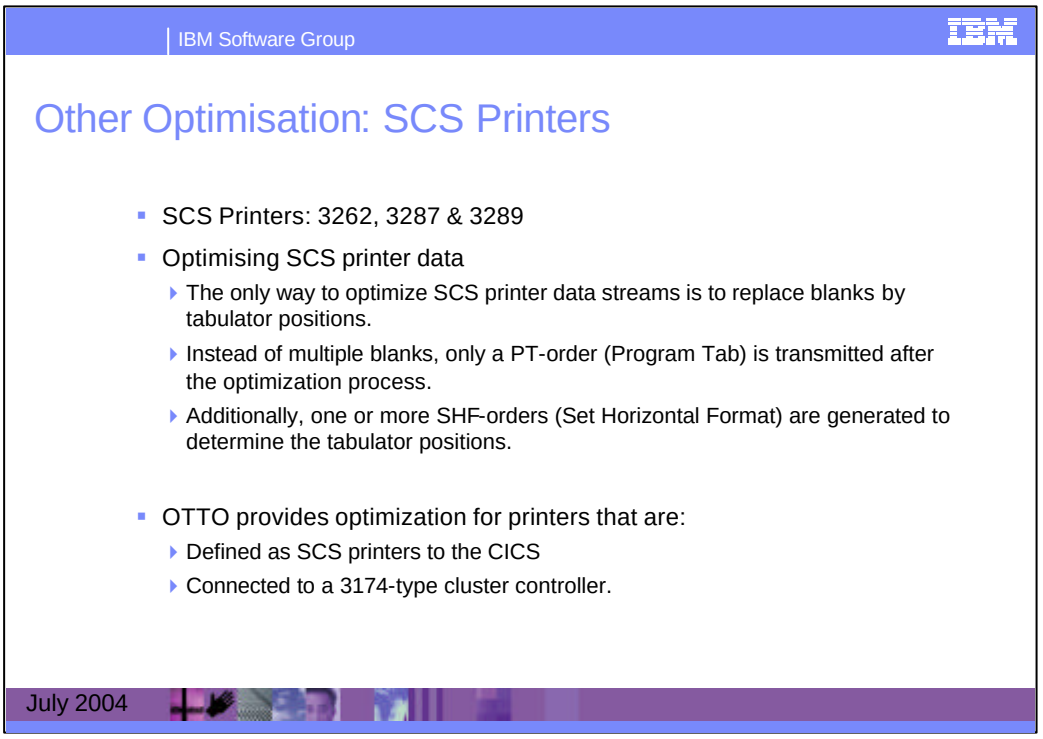
A sequence of more than four identical characters can be replaced by an RA order (Repeat-to-Address) which requires only four bytes. The RA function is a standard feature of 3270 type devices.

The data stream is sorted by buffer address, thus accelerating the screen display.

These techniques are used for terminals as well as for printers with a defined line length in the WCC (Write Control Character). For printers without defined line length, blanks followed by a NL (New Line) order are eliminated.

Additionally, spaces at the end of the line (without NL) are optimized.

With CICS OTTO, you can also handle such data streams as if the line length were defined using the WCC-IGNORE option.

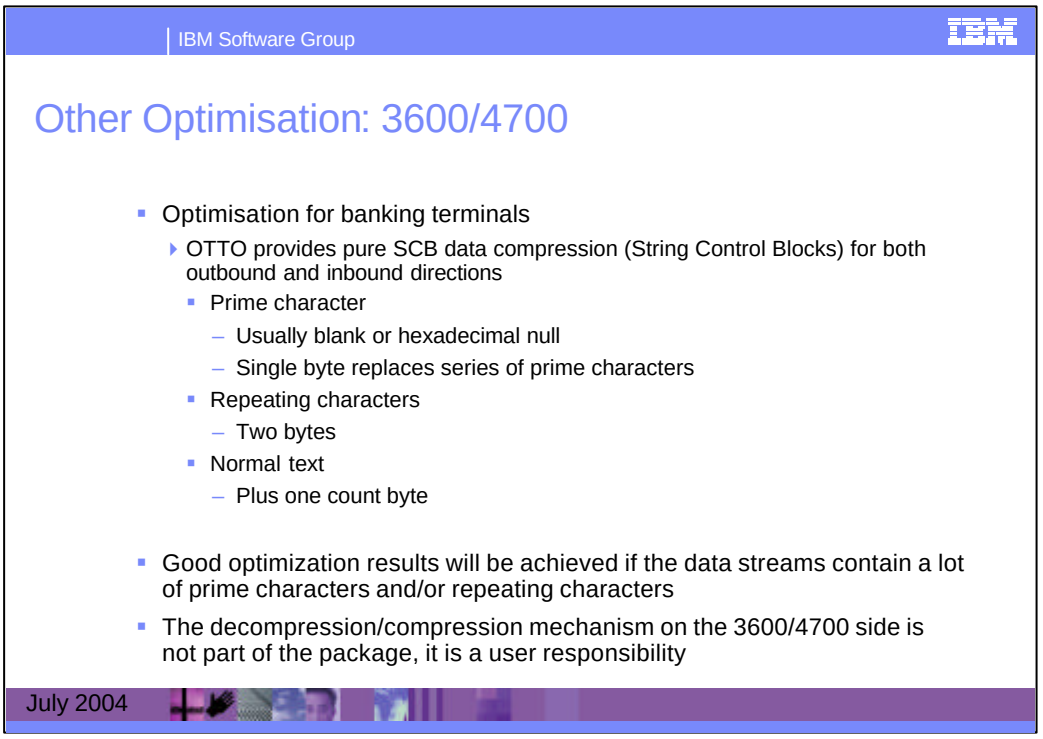


SCS Optimization Techniques

The only way to optimize SCS printer data streams is to replace blanks by tabulator positions.

Instead of multiple blanks, only a PT-order **(**Program Tab) is transmitted after the optimization process. Additionally, one or more SHF-orders **(**Set Horizontal Format) are generated to determine the tabulator positions.

CICS OTTO provides the ability to use the 3270 printer optimization techniques for printers that are defined as SCS printers to the TP system and connected to a 3174-type cluster controller.



3600/4700 Optimization Techniques

CICS OTTO provides pure SCB data compression **(**String Control Blocks) for both outbound and inbound directions. This technique distinguishes three categories of characters:

· Prime character.

· Repeating characters.

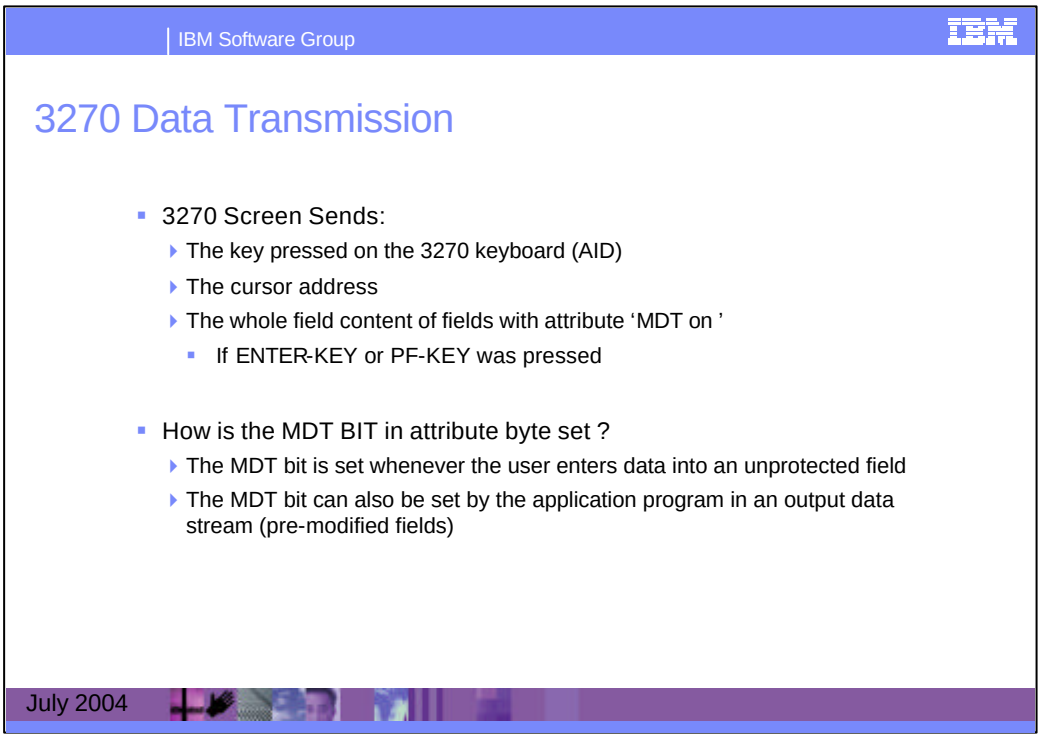
· Normal text.

The prime character is the most frequently used character in the data streams sent to the banking terminals (usually blank or hexadecimal null). After the optimization process, only one byte is transmitted instead of a series of prime characters. For repeating characters, two bytes are transmitted and for normal text the number of bytes of the text plus one count byte are transmitted. Good optimization results will be achieved if the data streams contain a lot of prime characters and/or repeating characters.

Module ABLSNA performs SCB compression/decompression. ABLSNA is responsible for the pure SCB data compression as described in the IBM manual, *SNA Sessions Between Logical Units* (GC20-1868), Part 2 Chapter 5. However, the FMH handling is dependent on the TP system. This special handling (such as setting the compression bit in the appropriate FMH) is performed by an interface module, ABLSNAI. A sample source member is distributed as ABLSNAI. Within this source member, all actions to be performed are described in detail.

The decompression/compression mechanism on the 3600/4700 side is not part of the package, it is a user responsibility.

The 3600/4700 Optimization may be started only for TP-System outbound messages (SET OPT OUT 3600) or for both directions (SET OPT FULL 3600).

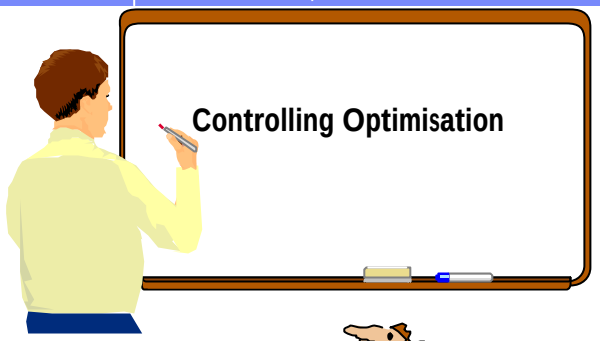


When a key is pressed on the 3270 keyboard, the following data are transmitted to the host :

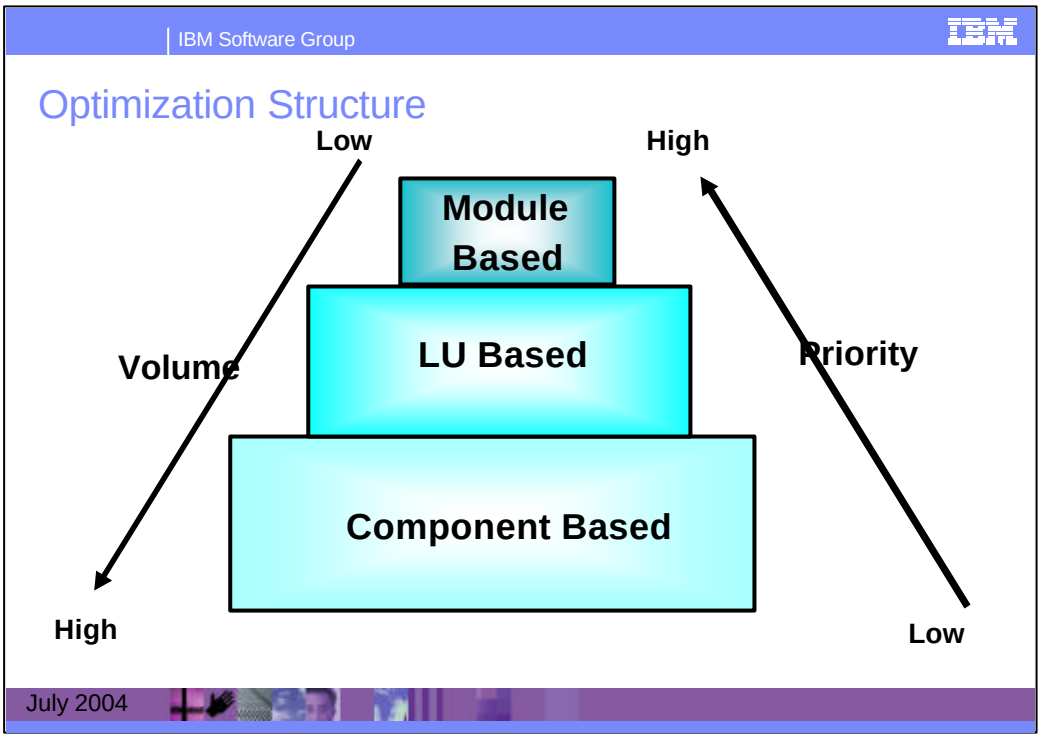
- The Attention ID (AID) which identifies the key

- The cursor address

- If the ENTER, or a PF key was pressed the whole field content of all fields with attribute "MDT on" is transmitted


Controlling Optimisation


CICS Tools



The optimization features of CICS OTTO are controlled based on two different types of start modes:

· Fully started indicates that **all** logical units (LUs) and modules will be included in

optimization **except** for those which are specifically excluded either because of active LU or

module exclusions.

· Selectively started indicates that only those messages which are destined for terminals

and/or printers specifically defined in the CICS OTTO selection list will be optimized.

The minimum definitions required are those that define which optimization features should ap-ply

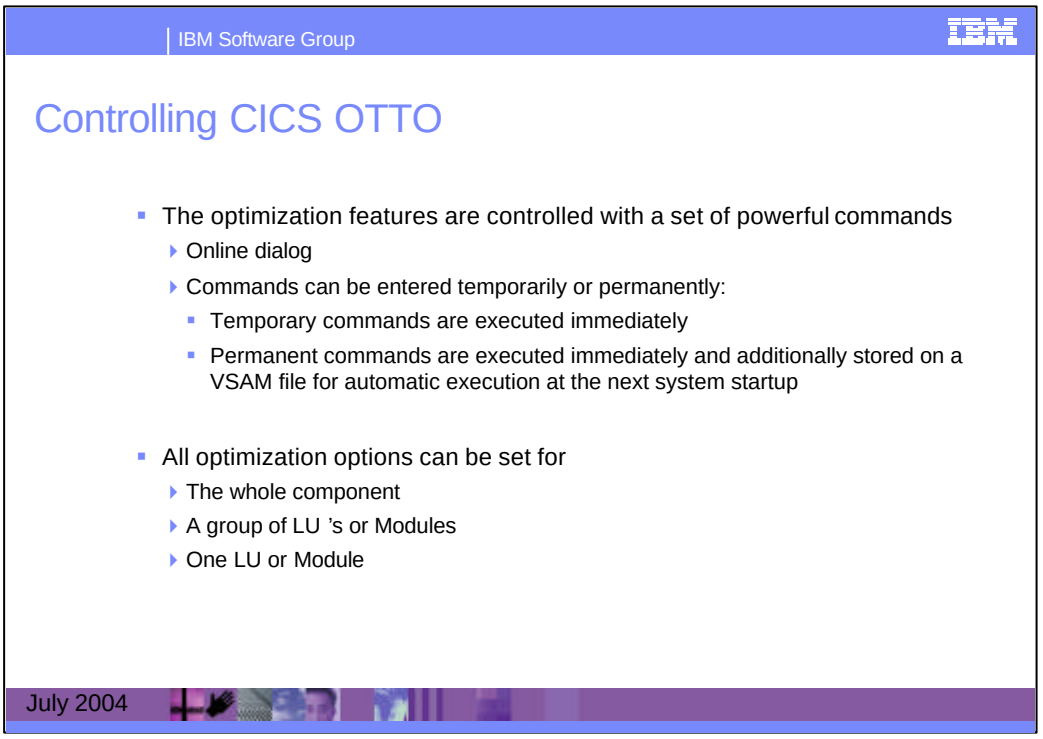
to the components. This is called Component Based Optimization. You can go further by

defining optimization features that are LU specific and module specific.

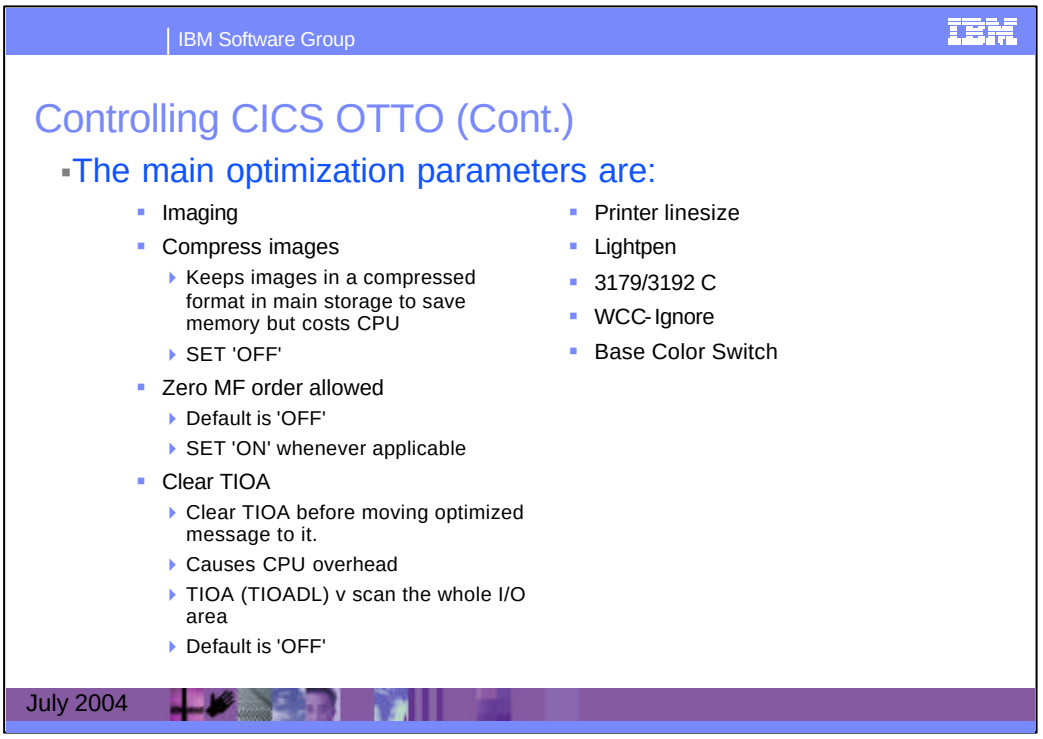
LU Based definitions take priority over the Component Based definitions. Module Based defi-nitions

take priority over both LU and Component Based definitions. This structure provides

that most of your optimization needs can be handled at the component level.



The optimization features described in the first chapter can be controlled using the CICS dialog panels. The majority of all functions can be performed using these interactive and self-explanatory panels without the need to know or understand CICS OTTO's native command language.



The main optimization considerations are :

- Imaging, or basic optimization only (default is "imaging", which includes basic optimization)

- Saved screen images can be compressed (which saves up to 50% of storage but requires some CPU overhead, default is "no compression")

- The MF-order (Modify Field) may be generated with a zero number of pairs. This kind of order is allowed for terminals which are 100% IBM compatible. As default, CICS OTTO does not generate such orders.

- The terminal input/output area (TIOA) can be cleared before CICS OTTO moves the optimized message to it. This option causes CPU overhead, and should only be activated if there are transactions that do not use the length field of the TIOA (default is "no clearing").

- The standard printer line size (default is 132)

- Are there terminals that may work with a light pen?

Default is "no lightpen support".

- Are there terminals of type 3179, or 3192?

Default is "no 3179/3192 support".

- Whether the line length in the WCC of a 3270 printer data stream should be honored (default is "yes").

- Whether there are terminals with the BASE COLOR SWITCH set on (default is "no such terminals").

On the whole, the default parameter settings are chosen to give a maximum optimization ratio with minimum CPU overhead.

Controlling CICS OTTO (cont.)

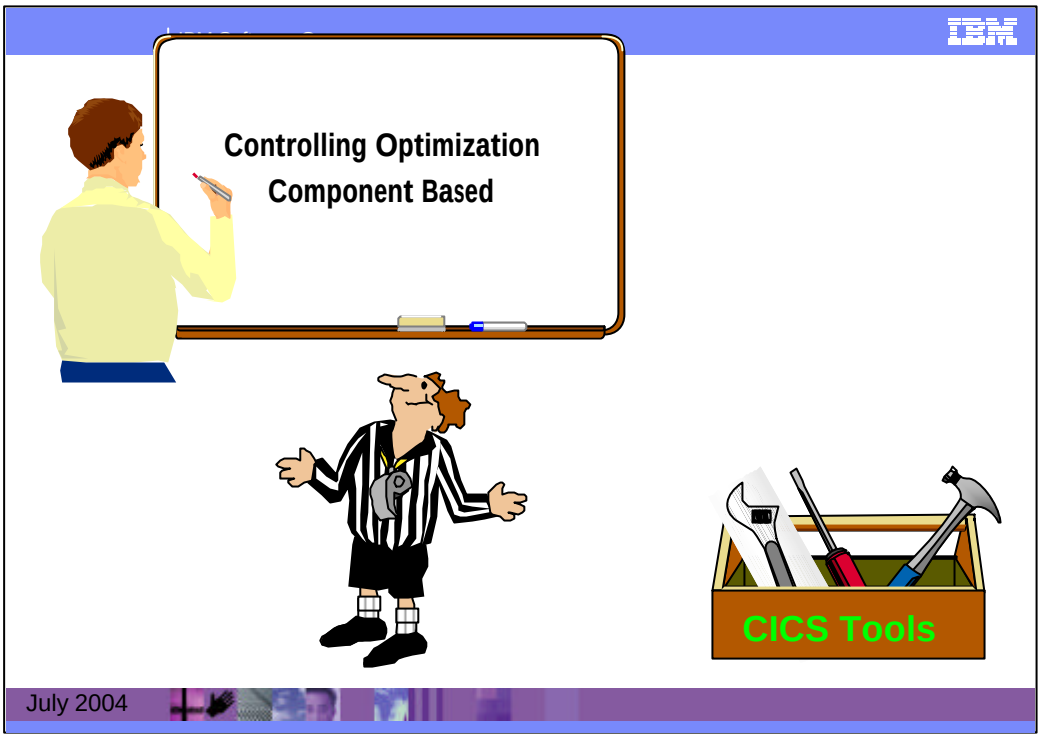
- The optimization features are controlled based on two different types of start modes:
  - Fully started - all LUs and modules are included
    - Unless they have been specifically excluded either because of active LU or module exclusions.
  - Selectively started - defined in CICS OTTO selection list
- The minimum required
  - Component Based Optimization
- Additionally:
  - LU specific optimization features
  - Module specific optimization features

Exclude LUs from Optimisation

- The exclude LUs from optimization panel is displayed when option 7 is entered on the primary option menu

This panel is displayed if you want to exclude a terminal from optimization (TC32, e. g.) : You have to

- select option 7 on the PRIMARY OPTION MENU
- enter "TC32" in the field "EXCLUDE LU . ."
- press ENTER



The optimization level as well as other processing-relevant information for a given message are

defaulted to the component values. The following options may be set for the 3270 component:

Imaging

Optimization

Image-Compression

Clear-TIOA

Lightpen

WCC-Ignore

Base-Color-Switch

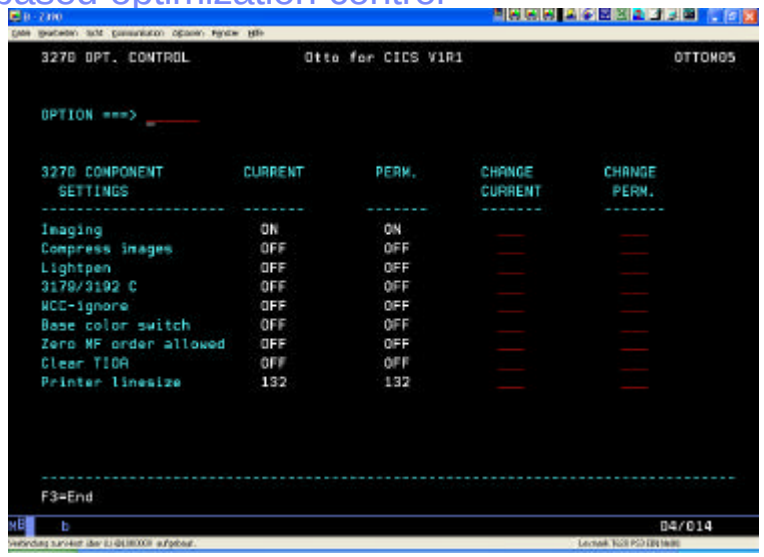
Printer-Linesize

3192

Zero-MF-Allowed

Component based optimization control

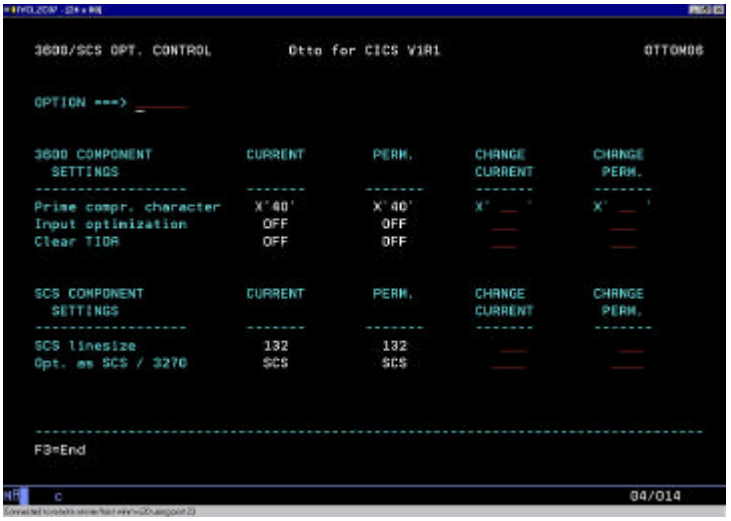
- The optimization features for 3270



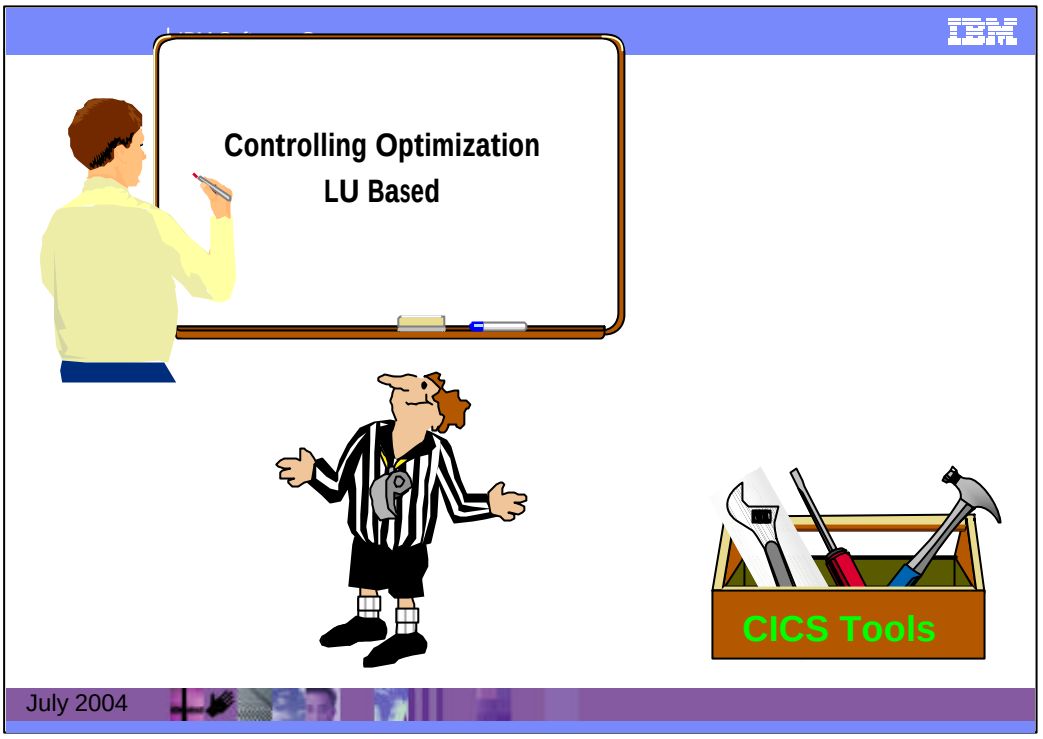
This Component Based Optimization Control panel is displayed when Option 3 is entered in the Primary Option Menu. It is used to change CICS OTTO's optimization features for all connected 3270 terminals and printers, except for those which have special settings for LU or modules different from the 3270 component values.

Component based optimization control (cont.)

- The optimization features for 3600 / SCS



This panel (Primary Option Menu - option 4) is used to change CICS OTTO's optimization features for all of the connected 3600/4700 terminals or SCS printers, except for those which have special settings for LUs or modules different from the 3600/4700 or SCS component values.



One or more component defaults may be overwritten by specific terminal settings, called LU

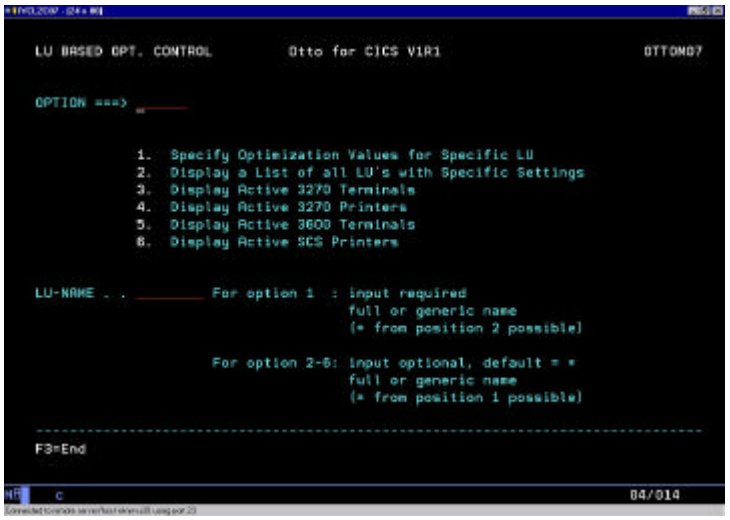
settings. All options as described for the component may be set for one or more LUs. LU set-tings

have a higher priority than the component values.

LU based optimisation control

- One or more component defaults may be overwritten by specific terminal (LU) settings
- All component options may be set for one or more LUs.
- LU settings have a higher priority than the component settings
- The LU based optimization control menu is displayed when option 5 is used from the primary option menu

LU-based optimization control ...



This Panel is displayed when Option 5 is entered in the Primary Option Menu. This LU BASED OPT. CONTROL menu is used to select several panels that allow you to view or change CICS OTTO's optimization features for a single LU or a group of specific terminals/printers (LUs) connected to the CICS system.

LU-based optimization control ...

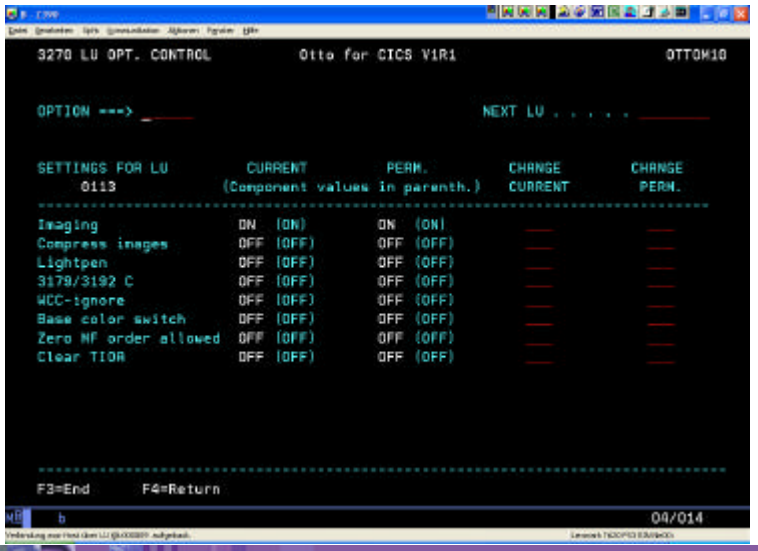
- The LU LIST panel is displayed when options 2 through 6 are entered on the previous menu

```
LU List (lu type )          Otto for CICS V1R1                    OTTOM08
OPTION ===> ______ DISPLAY CRITERIA *_______    Entries        1 to 44 of 48
                                                                MORE: +
         Selection for LU based optimization control
   LU                  LU                  LU                  LU
 ------------------------------------------------------------------------------
_ LU00*               _ LU01*             _ LU02*             _ LU03*
_ LU11*               _ LU12*             _ LU13*             _ LU14*
_ LU15*               _ LU16*             _ LU17*             _ LU18*
_ LU19*               _ LU21*             _ LU22*             _ LU23*
_ LU24*               _ LU25*             _ LU26*             _ LU27*
_ LU28*               _ LU29*             _ LU31*             _ LU32*
_ LU33*               _ LU34*             _ LU35*             _ LU36*
_ LU37*               _ LU38*             _ LU39*             _ LU41*
_ LU42*               _ LU43*             _ LU44*             _ LU45*
_ LU46*               _ LU47*             _ LU48*             _ LU49*
_ AAAA                _ BLA               _ PR00              _ PR01
                                                               MORE...
 ------------------------------------------------------------------------------
 F3=End    F7=Backward    F8=Forward    F4=Return
```

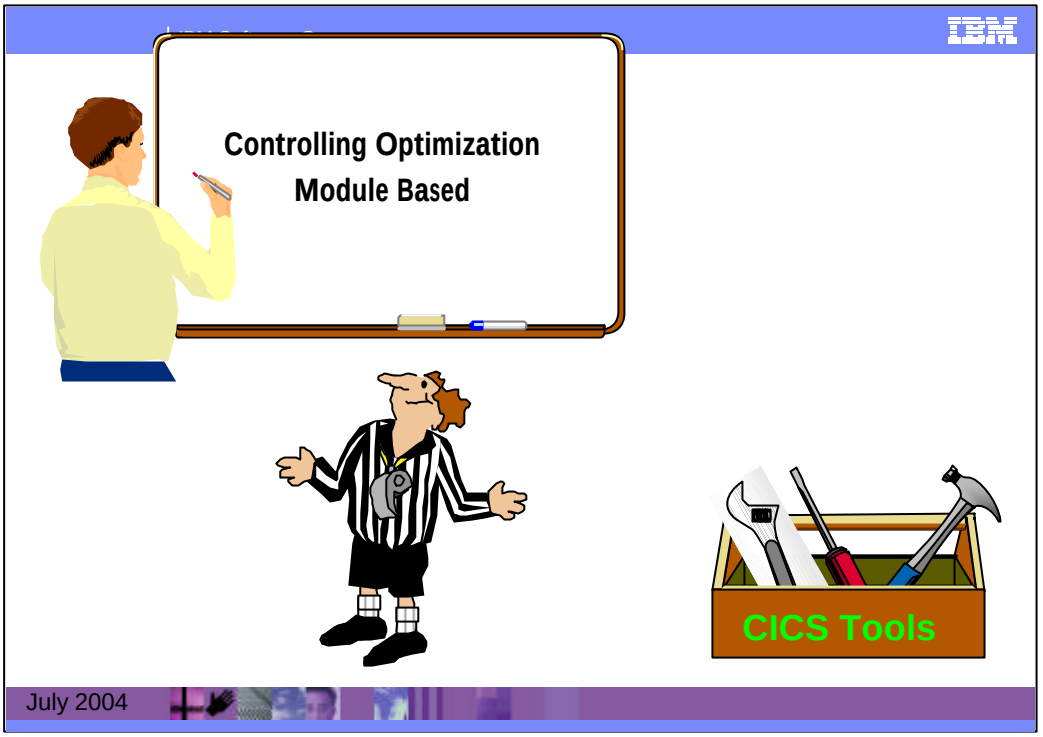

This is another example of an LU based optimization control. This panel (the list of active 3270 terminals) is displayed if option 3 is selected in LU BASED OPT. CONTROL menu.

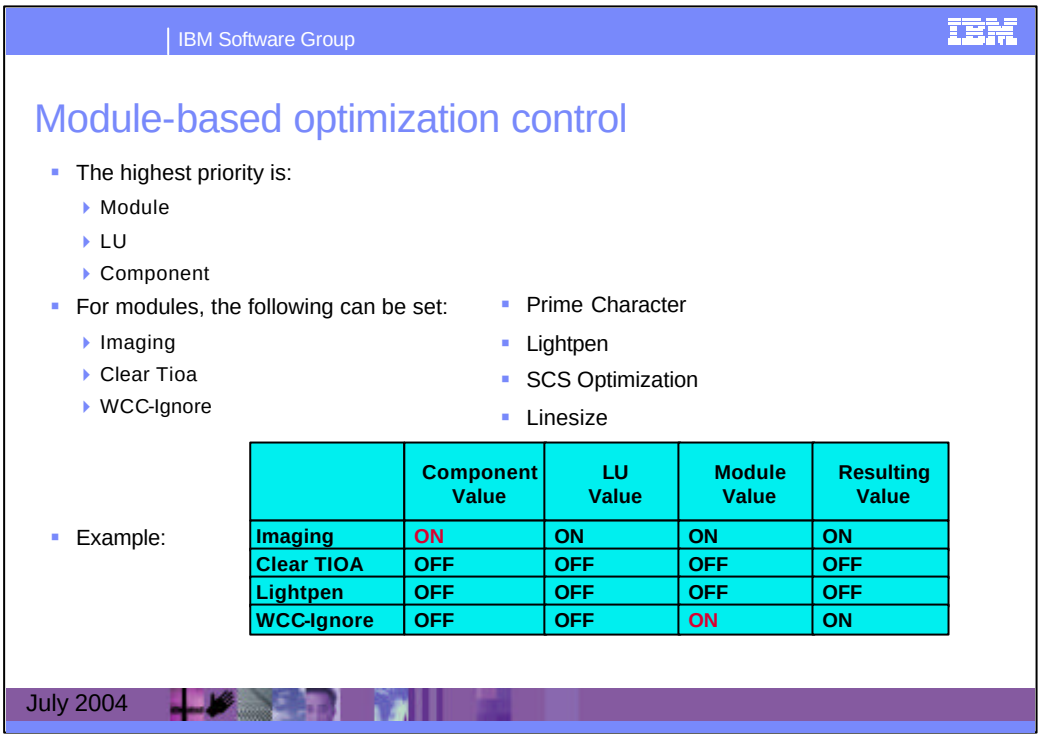
LU-based optimization control ...

- The optimization features for 3270



One of the ways to display this panel is to enter option 3 in LU BASED OPT. CONTROL menu, and then select an active terminal. This panel is used to control LU optimization features for 3270.


Controlling Optimization
Module Based
CICS Tools



The following options may be set for specific modules:

Imaging Optimization

Clear-TIOA Lightpen

WCC-Ignore Opt. as SCS/3270

Prime-Compression-Char

If one of the above options is set for a specific module and differs from the component value, any

current LU-specific settings for these options are ignored for messages sent by the specific module destined for the specific LU. All other options that can be set for the component or LU but **not** for a module are taken from any current LU settings, or lastly from the component settings.

For example, assume the following controls are issued:

SET OPTIMIZATION OUT IMAGE ALL PERM

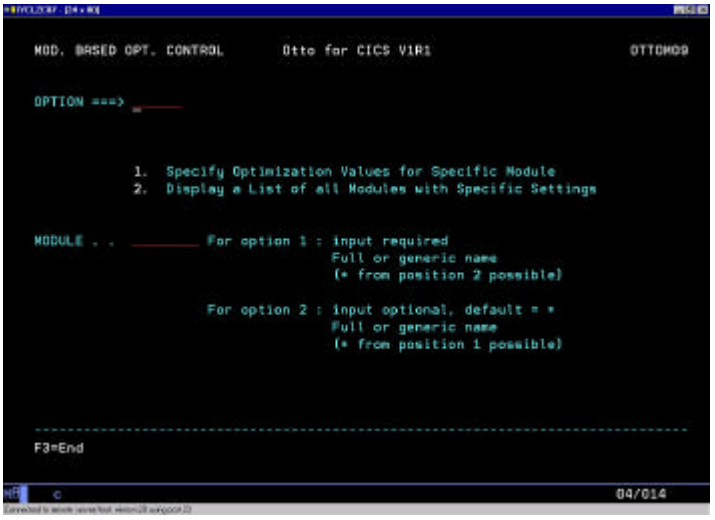
SET WCC-IGNORE ON MOD= pgm PERM

As a result, the settings highlighted in the table, are active for the component, the LU, and module.

If a message is sent by the module *pgm* to the LU *name* the module settings for the above options are assumed. All options that are not explicitly set for a module are defaulted from the LU value (if it exists) or from the component.

Module-based optimization control ...

- The Module-based optimization control menu is displayed when option 6 is used from the primary option menu



For modules, the following optimization features may be set:

- Imaging
- Clear Tioa
- WCC-Ignore
- Prime Character
- Lightpen
- SCS Optimization
- Linesize

The highest priority for settings is 1) the module, 2) the LU, and 3) the component.

This means if one or more of the above options is set for a specific module and the setting is different from the component settings or the LU specific settings, the module settings override the messages sent by the specific module destined to the specific LU. All other options which can be set for the component or LU, but not for a module are taken from the component settings or eventually present LU settings.

This Module Based Optimization Control Menu is displayed when Option 6 is entered in the Primary Option Menu.

Module-based optimization control ...

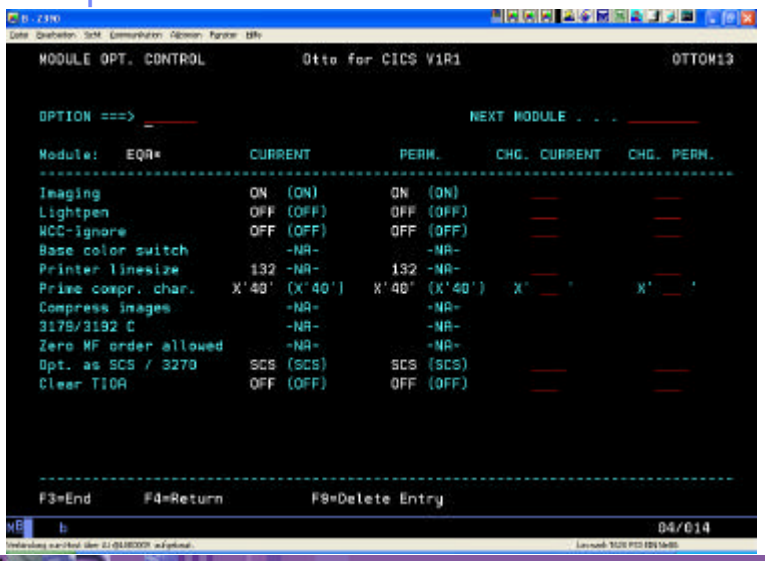
- The Module LIST panel is displayed when option 2 is entered on the previous menu

```
Mod. List (Spec. Sett.)          Otto for CICS V1R1                OTTOM08
OPTION ===> ______ DISPLAY CRITERIA *_______            Entries 1 to 3 of 3
              Selection for module based optimization control
  MODULE              MODULE              MODULE              MODULE    ------------
-------------------------------------------------------------------
_ MOD00000          _ MOD00001          _ OTTO*


-------------------------------------------------------------------------------
F3=End F7=Backward F8=Forward F4=Return
```

Module-based optimization control ...

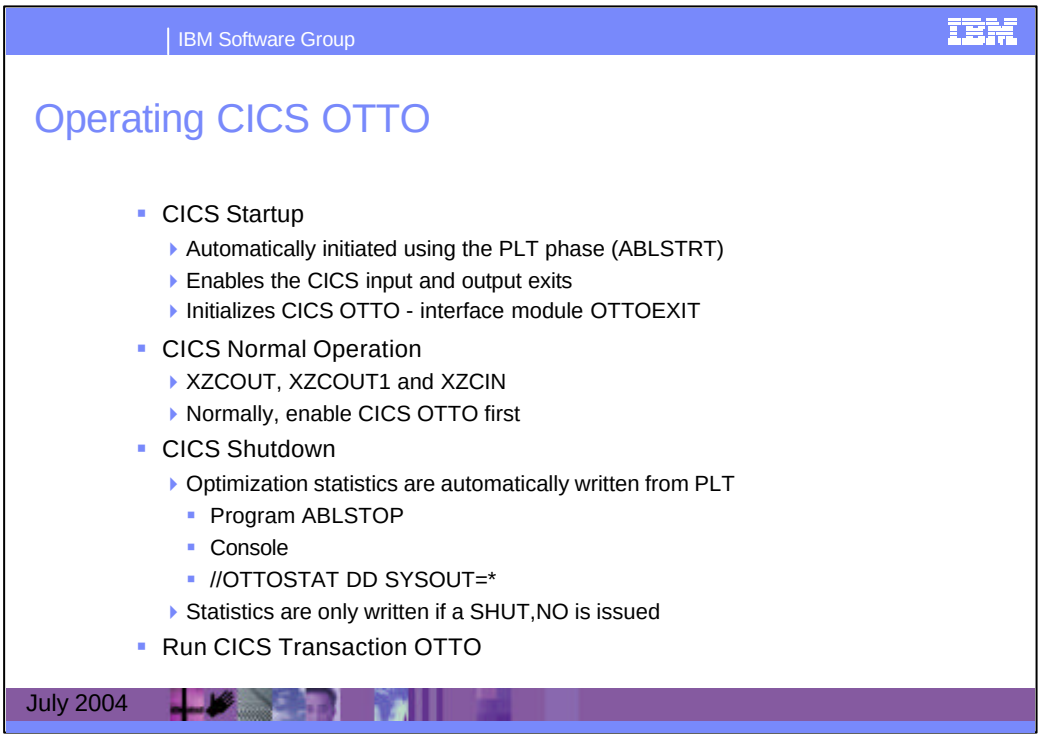
- The optimization features for Module



This panel can be displayed if module name is entered and option 1 is selected in the Module Based Optimization Control Menu. Here you can change optimization features for the selected module.

CICS OTTO is invoked via CICS standard output and input message edit exits. Startup is automatic when the CICS region is started.

To monitor and control the operation of CICS OTTO, call the OTTO transaction that supports all needed commands.



CICS Startup

CICS OTTO is automatically initiated using the PLT -phase ABLSTRT at CICS startup time. ABLSTRT enables the CICS input and output exits and initializes CICS OTTO by calling the interface module OTTOEXIT. All other routines are loaded from the VSAM control file OTTOMOD into the private area of the CICS region above the 16 MB line. All other required storage such as work areas, control blocks and the image pool is also acquired from above the 16 MB line.

CICS Normal Operation

CICS OTTO gets control of all input and output messages using standard CICS exits:

XTCOUT and XTCIN in case of BTAM

XZCOUT, XZCOUT1 and XZCIN in case of VTAM

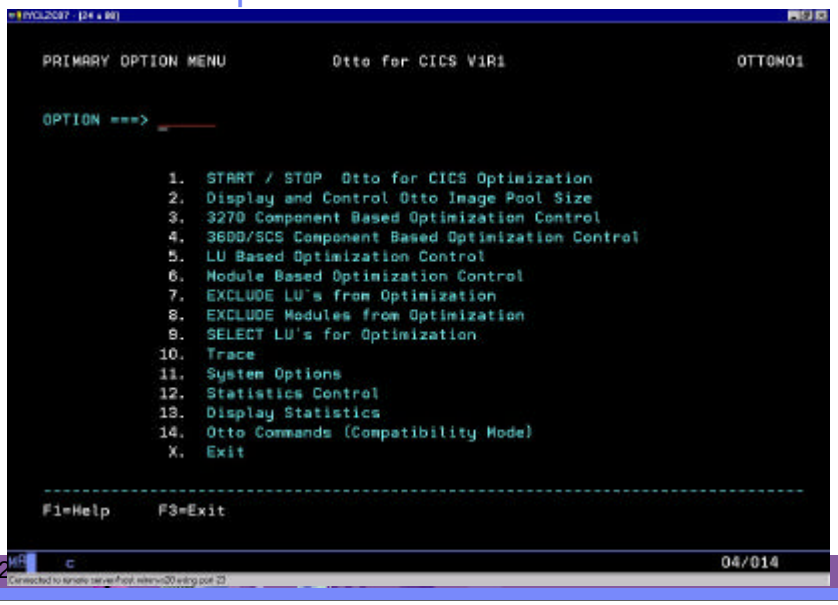
If your installation is already using one or more of these exits, the order in which they should be enabled depends on the logic they perform. Generally, CICS OTTO should be the first one to get control of all messages, i.e. it should be the first one to be enabled. However, contact IBM Support if you want to use more than one program for the above exits.

3270, SCS and 3600/4700 type messages are optimized depending on the various start and control options. Additionally the user exit may influence the optimization.

CICS Shutdown

Optimization statistics are automatically written to the console or, if DD statement OTTOSTAT is present, to the statistics file at CICS shutdown time. This is initiated using the PLT program ABLSTOP.

CICS OTTO - Operation



This is the Primary Option Menu which is used to access other menus and panels that allow you to control all optimization features, run traces, and manage system statistics.

Available controls enable you to:

- Start or stop CICS OTTO for each component type
- Display and control the image pool size
- Select or exclude specific terminals or modules to optimize
- Dynamically add or remove terminals or modules from optimization in runtime
- Start and stop trace
- Display statistics

The exclude list is used to say that optimization should not be performed on certain logical units because, for example, they are using the session to do a file transfer.

The list of commands end with some statistics to show how well optimization is being performed.

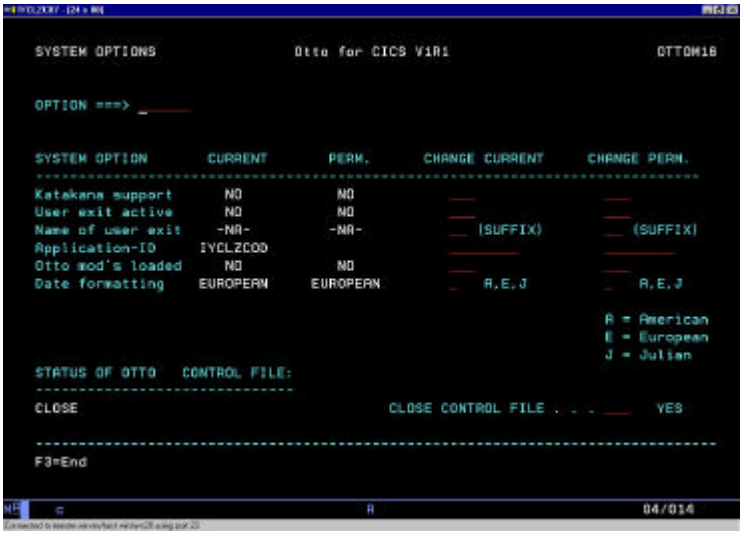
Controls can be set on temporary or permanent basis.

Also, by utilizing the provided user exits it is possible to:

- Use return codes to process specific messages unchanged
- Keep and reinsert message parts after optimization
- Change characters for specific countries.

System Options

- The System options panel is displayed when option 11 is entered on the primary option menu



Here you can define general processing parameters, such as date format, exit support, etc.

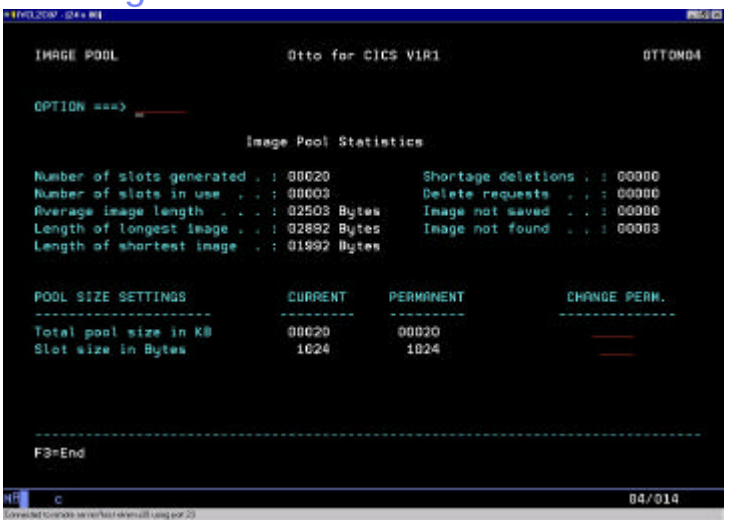
This System Options panel is displayed when option 11 is entered on the Primary Option Menu.

Start / Stop Optimization

This START/STOP Panel (Primary Option Menu - option 1) displays the current optimization status for each component and provides you with the option to change this status.

Display & Control Image Pool

- The image pool panel is displayed when option 2 is entered on the primary option menu.



This panel is used to display and change the size of CICS OTTO's image pool. The image pool is allocated in the private area above 16MB. Imaging means a copy of each screen is kept in main storage. CICS OTTO's image tool is used for this. Imaging starts with the first outbound message written by the application with an ERASE/WRITE. All of the following messages that are destined to the same terminal will be compared with the existing data in the screen image and only changed data and attributes will be transmitted after the optimization process. Consequently, the screen image is updated with the new data and attributes.

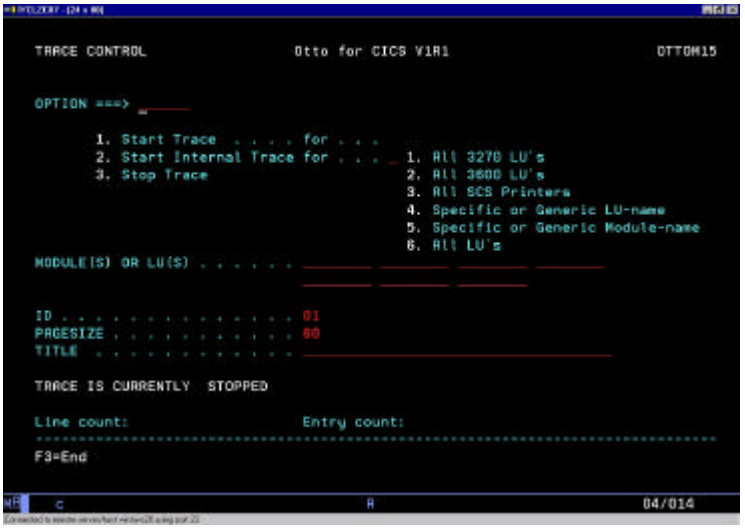
The IMAGE POOL panel is displayed when option 2 is entered on the PRIMARY OPTION MENU.

CICS OTTO will trace all input and output messages before and after optimization for those components for which the trace facility was

activated. The trace file is opened when a trace is started, and closed when the trace is stopped.

CICS OTTO Trace Control

- The trace control panel is displayed when option 10 is entered on the primary option menu



Message traces can be produced before and after each optimization for LUs and modules. Traces may be useful for error determination.

The TRACE CONTROL panel is displayed when option 10 is entered on the PRIMARY OPTION MENU.

Use the TRACE CONTROL panel to define the characteristics of a trace.

1. Start Trace allows you to start a message trace.

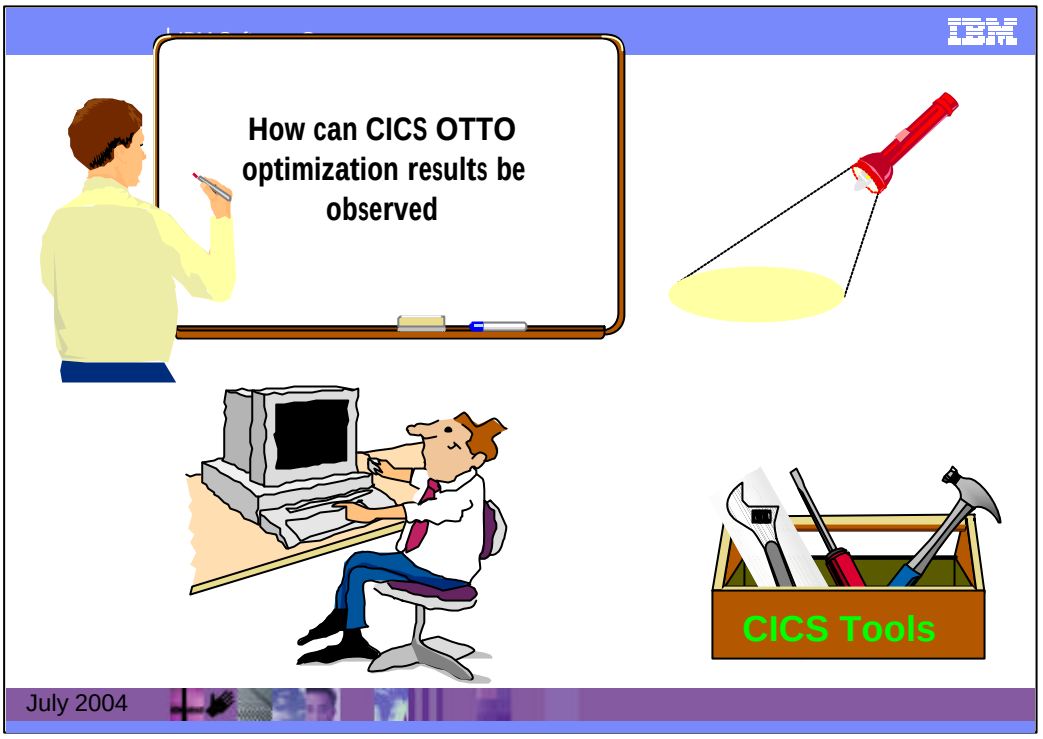
2. Start Internal Trace starts an internal trace. This trace should only be performed if requested

by your technical support representative.

3. Stop Trace closes the trace file and makes it available for printing. The trace file should be

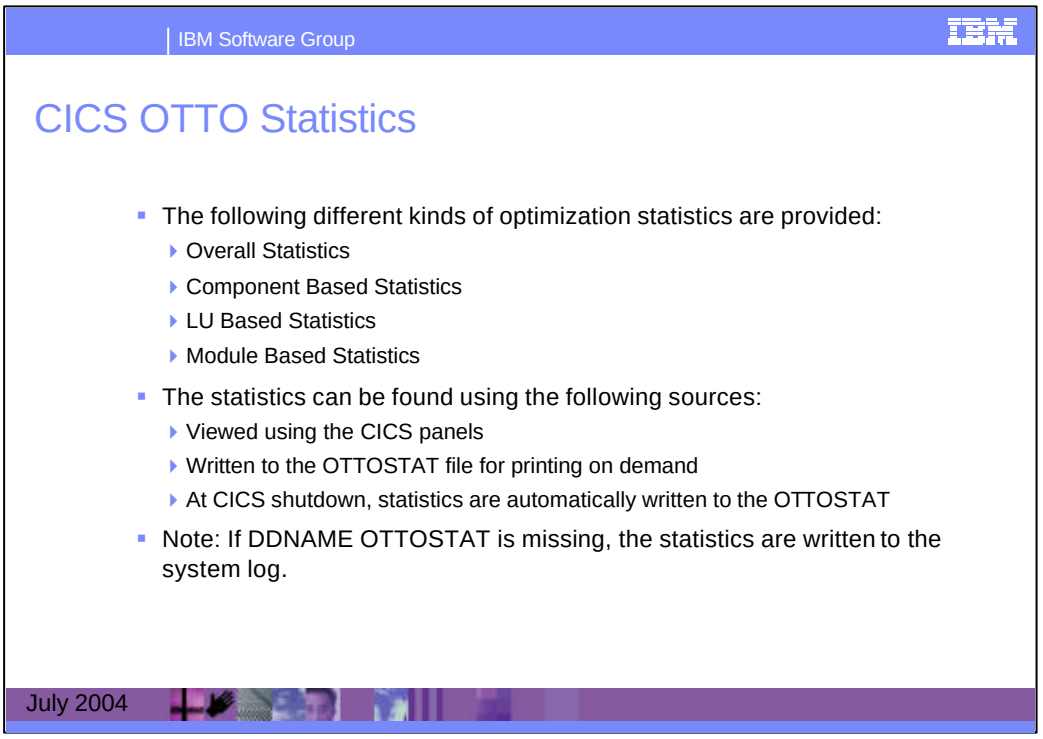
printed before a new trace is started. Otherwise, the trace information previously written

may be lost.



CICS OTTO optimzation results can be fully viewed online via the OTTO transaction. Most of the statistics can also be written to the

OTTOSTAT file (or the system log).



Optimization results can be viewed and analyzed using CICS OTTO's statistics. These statistics show how many messages have been optimized and how many bytes have been saved during the optimization process. If CICS OTTO is fully started, all messages are counted except those for which an LU or module exclusion was active. If CICS OTTO is selectively started, only the messages destined to those LUs which are in CICS OTTO's selection list are counted.

The following different kinds of optimization statistics are provided:

- Overall Statistics: provide a graphical summary of all optimization results for all LUs; 3270, SCS and 3600. This information is provided only online.

- Component Based Statistics: show counters for message optimization and saved bytes, as well as total reduction expressed as a percentage. For the 3270 component, these statistics are separated by terminal statistics (T3270) and printer statistics (P3270).

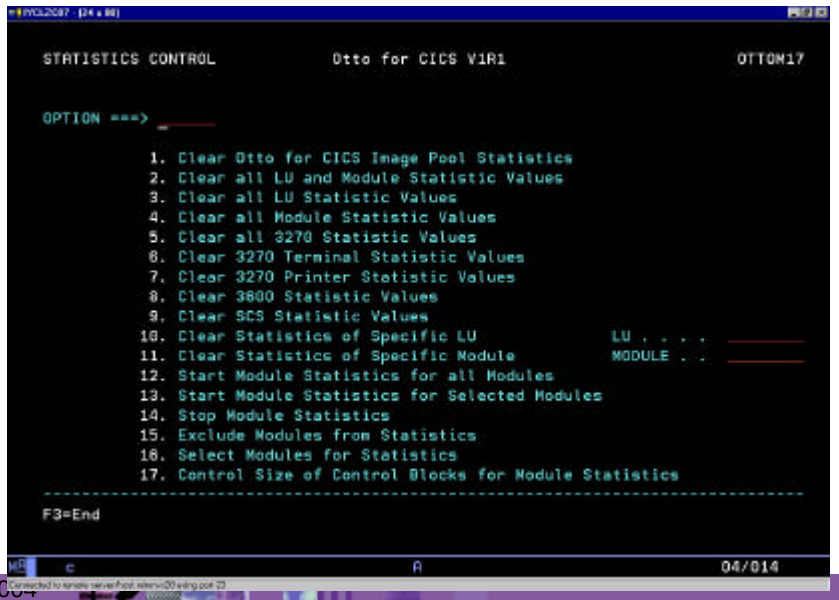
- LU Based Statistics: always active. However, these are available only online. Statistical information can be obtained for a single LU, for a group of LUs qualified by a generic name, or different LU types.

- Module Based Statistics: an option allows accumulation of module statistics the same as for LUs. The module name is obtained from CICS PCTIPIA, if available. Otherwise, the PCTTI is used if the transaction name was generated. Module based statistics are available only if they have been explicitly activated.

Module statistics should only be used to figure out modules/transactions that have a low optimization ratio. Module statistics cause CPU overhead. Therefore, you may wish to exclude modules with a low optimization ratio. Statistical data may be collected for a list of predefined modules by starting the module statistics selectively or for all modules by starting them fully.

On each of the statistics panels (except the LU STATISTICS SUMMARY) you can use PF9 to write the statistics to the OTTOSTAT file.

Statistics Control

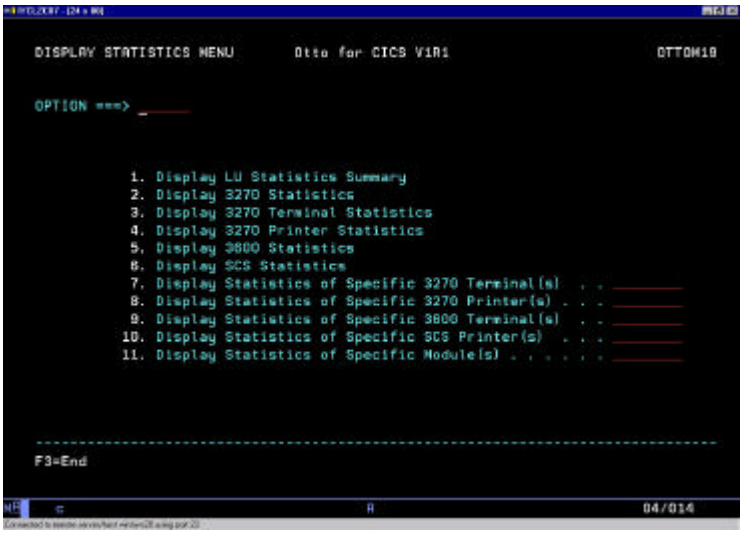


The STATISTICS CONTROL menu is displayed when option 12 is entered on the PRIMARY OPTION MENU.

STATISTICS CONTROL panel can be used to issue commands and define variables that control the statistical information that is gathered. Such controls include:

- Clearing statistics. This means set all counters to zero.
- Starting statistics for all or specific modules.
- Stopping module statistics.
- Selecting modules for the statistics.
- Excluding modules from the statistics.
- Changing the restricted size of the module statistics in main storage.

Display Statistics

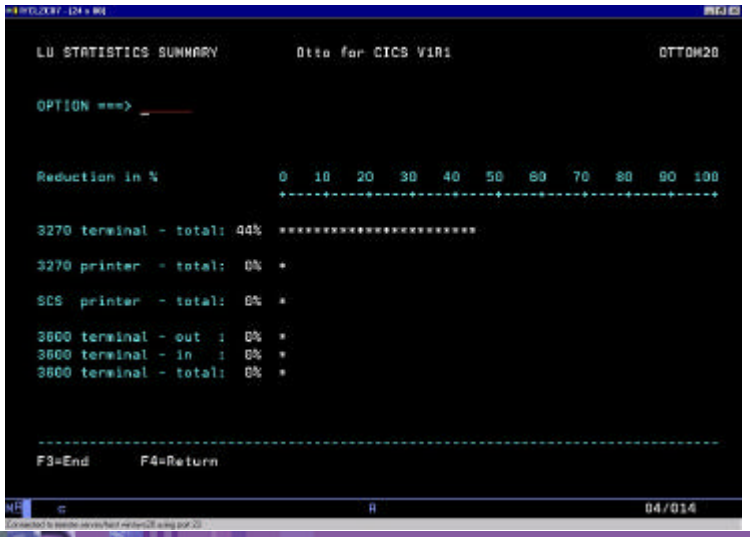


- Option 1 ==>

Statistics can be accessed using the DISPLAY STATISTICS MENU. This menu is displayed when option 13 is entered on the PRIMARY OPTION MENU.

CICS OTTO - LU Statistics summary

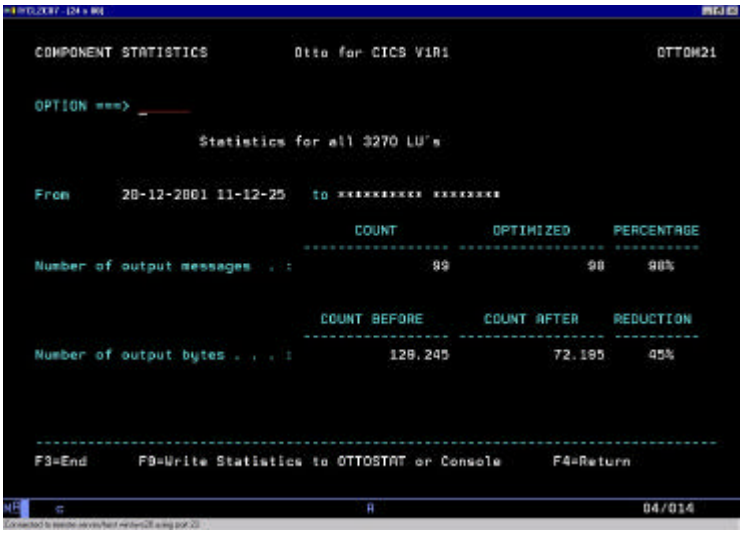
- Optimization results can be viewed using OTTO's statistics



In this screen you can see a simple graph showing the LU Statistics Summary. In this example the 3270 data streams are being reduced by 44%.

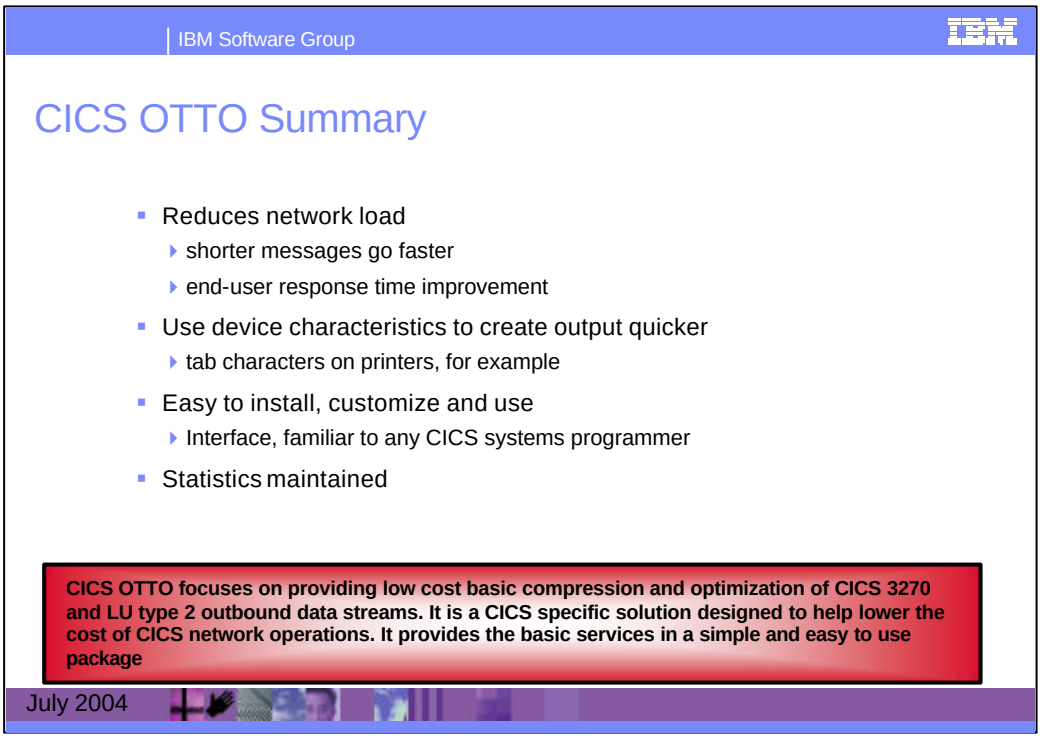
CICS OTTO - Component Statistics

- The component statistics panel is displayed when options 2 - 6 are used on the Display Stats Menu



These statistics for 3270's show that 98% of messages have had some optimization performed on them (98 messages out of the total of 99 messages sent from CICS). The second line shows that the number of characters transmitted is 72,195 with an input to the optimizer of 129,245. A reduction of 45% has been achieved.

Option 2 has been selected in the Display Statistics Menu to display these statistics.



CICS OTTO focuses on providing low cost basic compression and optimization of CICS 3270 and LU type 2 outbound data streams. It is a CICS specific solution designed to help lower the cost of CICS network operations. It provides the basic services in a simple and easy to use package.

Appendix

Useful Information on CICS

Useful information

CICS Web site

CICS Product Web Page: Contains product information including highlights and benefits, announcements, services, supportpacs, publications for CICS TS 2.3 and the CICS Tools
ibm.com/cics

Bibliography:

CICS Online Transmission Time Optimizer for z/OS User's Guide. SC34-6104

SNA Sessions Between Logical Units (GC20-1868)