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16 August 2011

Accelerated Value Knowledge Share: ITM - Adaptive Monitoring

Tivoli software

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Agenda

- Adaptive Monitoring
  - Benefits
  - Terminology
- Dialog Windows
  - Situation Override
    - Eligibility
  - Scheduling
  - Baselines / Models
- Troubleshooting
- Technotes and APARs
- Command Line
  - OPAL Script
- Demonstration
- Q&A

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Adaptive Monitoring Benefits

- Granular control of situations
- Override threshold and configuration settings based on the needs of the individual resource, line of business, geographic location, etc.
- Create time-sensitive thresholds (calendar-based).
- Calculate baseline values using statistical functions for a situation attribute based on historical data

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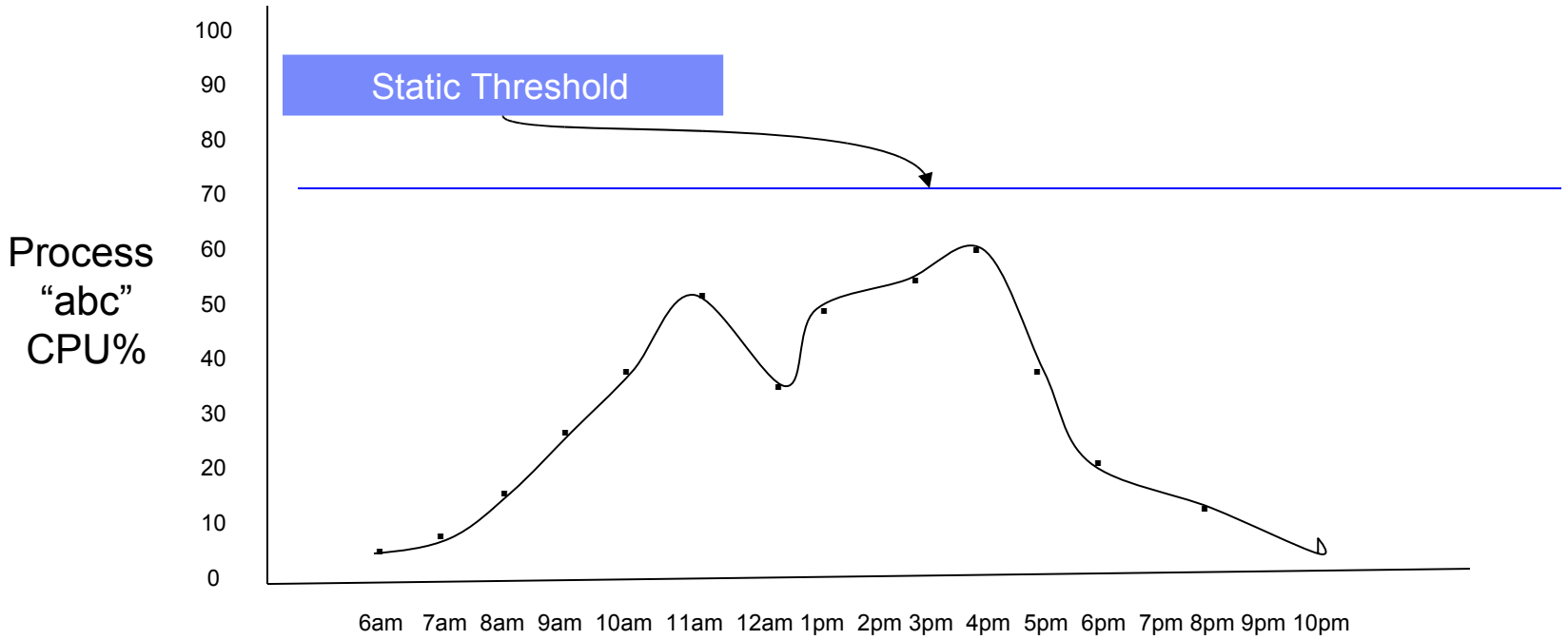
Fixed Threshold Monitoring



- No automated approach to define
- No warning of abnormal behaviors prior to peak periods
- No flexibility in the monitoring environment

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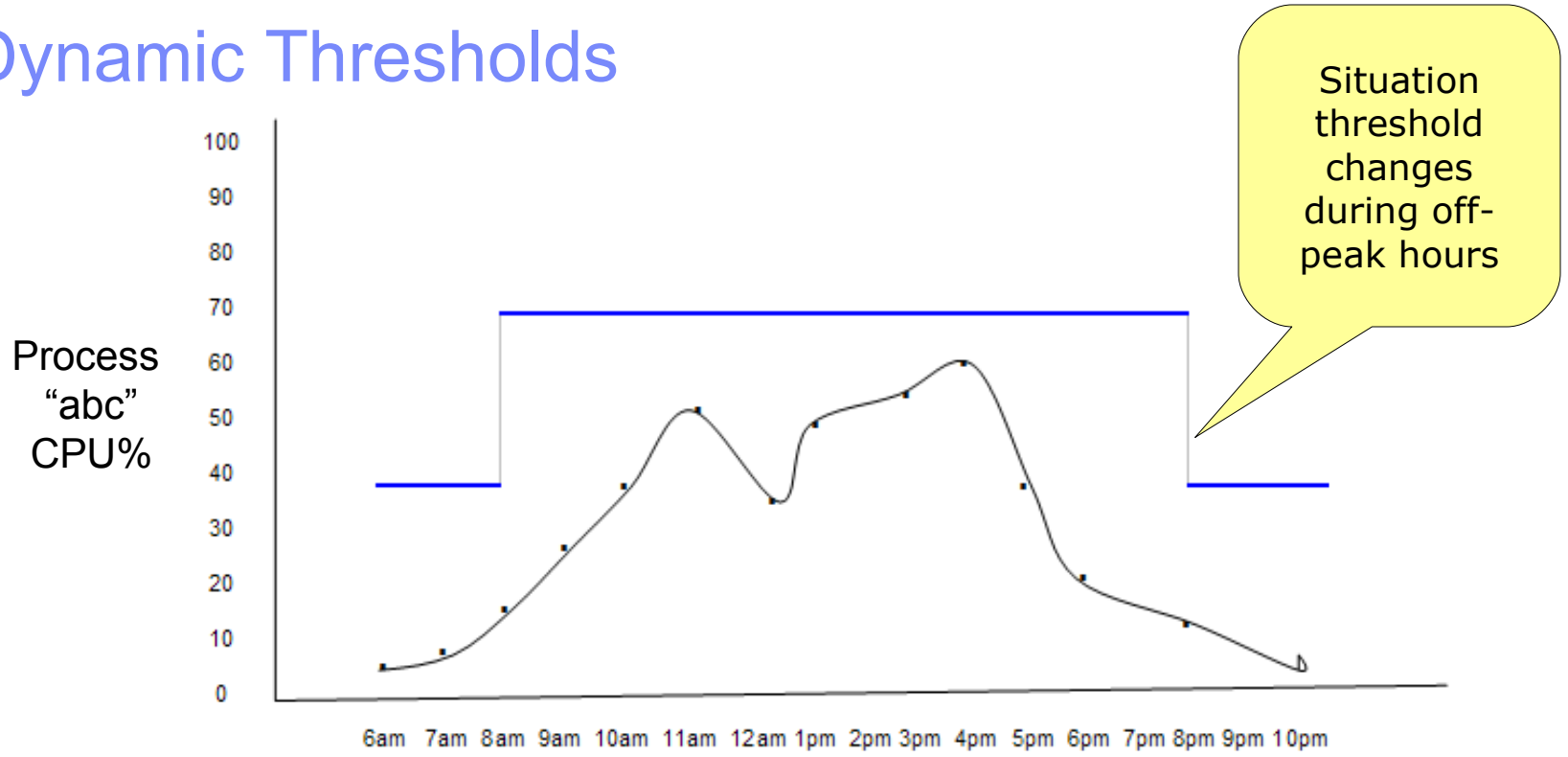
Dynamic Thresholds



- ✓ Automated definitions with + or - variation using baselining
- ✓ Proactive warning when abnormal behavior occurs during nonpeak periods
- ✓ Scripting can provide automated updates when changes take place

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Terminology

- Situation Modeling – calculate a proposed threshold based on historical data
- Situation Override – a situation or schedule distributed to an agent overrides a situation distributed to a list
- Dynamic Thresholding – threshold changes are determined by schedule
- Situation Override and Dynamic Thresholding are often used interchangeably

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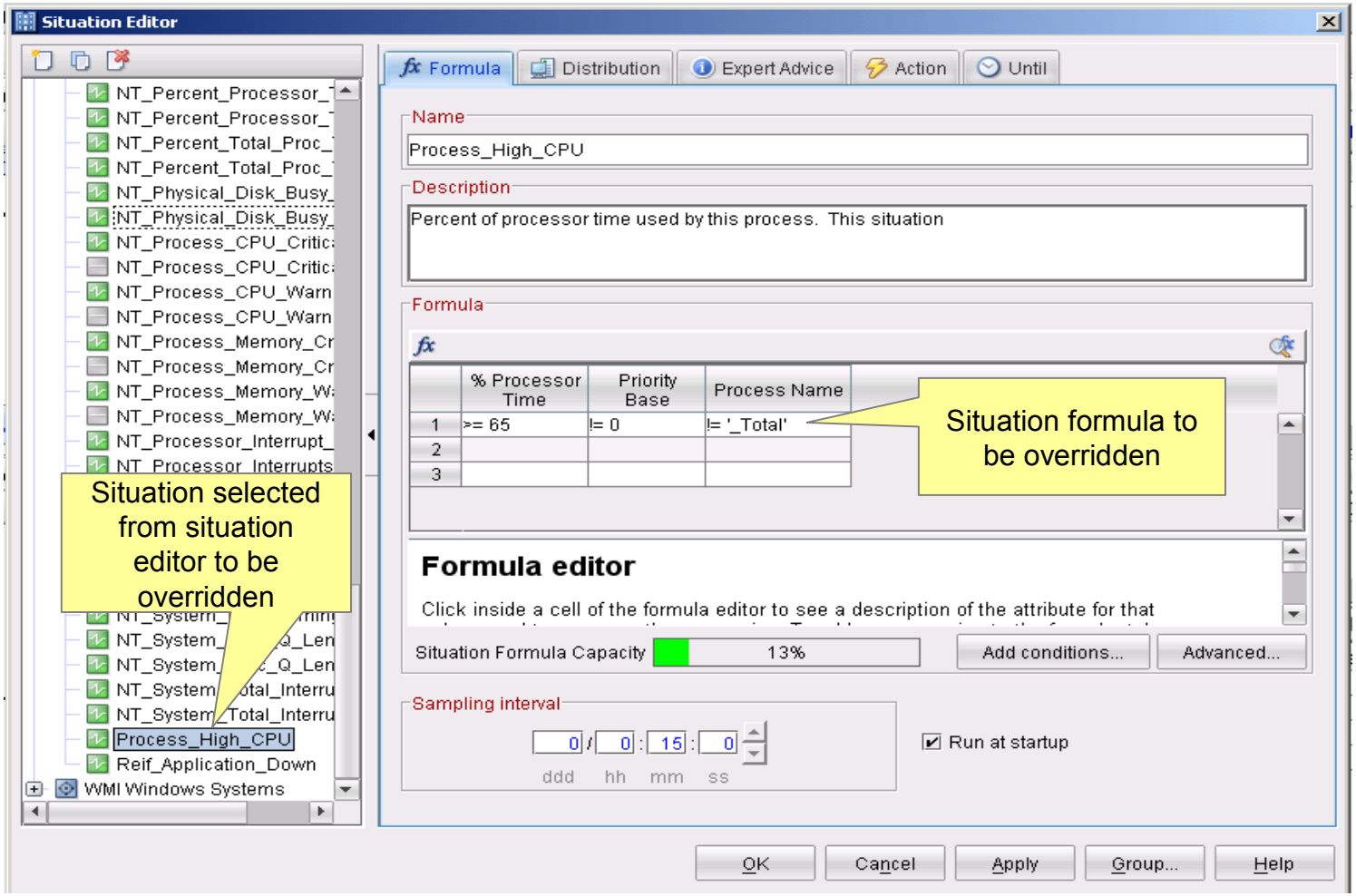
TEP Situation Override Editor – entry point: Situation Editor



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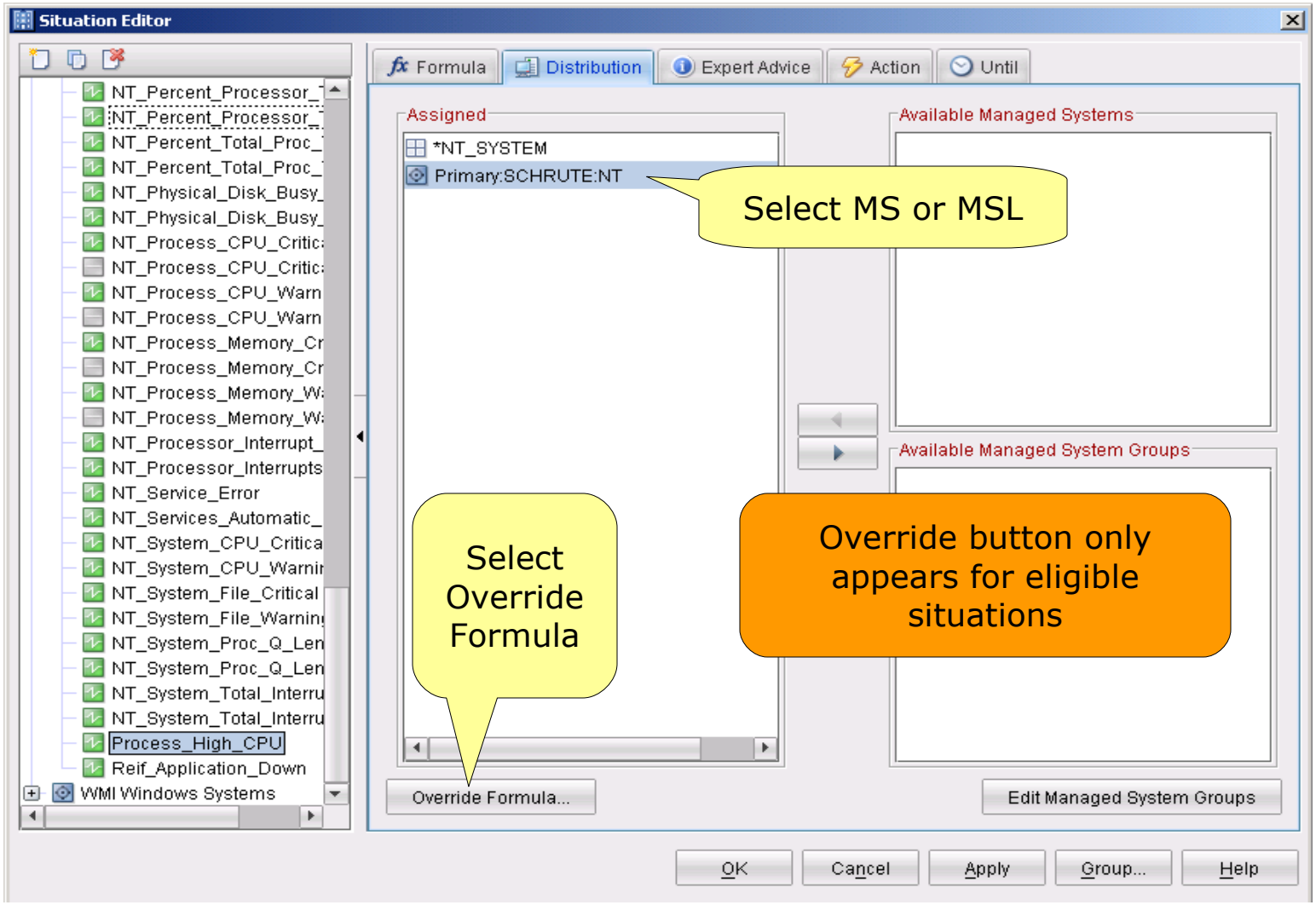
TEP Situation Override Editor – entry point: Situation Editor



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Override Eligible Situations

- The following types of situations are override INELIGIBLE. No parts of these situation formulas are allowed to be overridden.
  - -Embedding situations (situations that embed other situations)
  - -Correlated situations (these are only executed at the Hub TEMS)
  - -Situations that are ONLY distributed to the TEMS
  - -Situations containing multi attribute group formulas (multiple tables)
  - -Situations containing expressions involving column functions
  - *MIN, *MAX, *AVG, *SUM, *COUNT, *CHANGE, *PCTCHANGE
  - -Situations containing expressions involving the following row functions:
  - *STR, *SCAN, *MISSING, *TIME, *DATE

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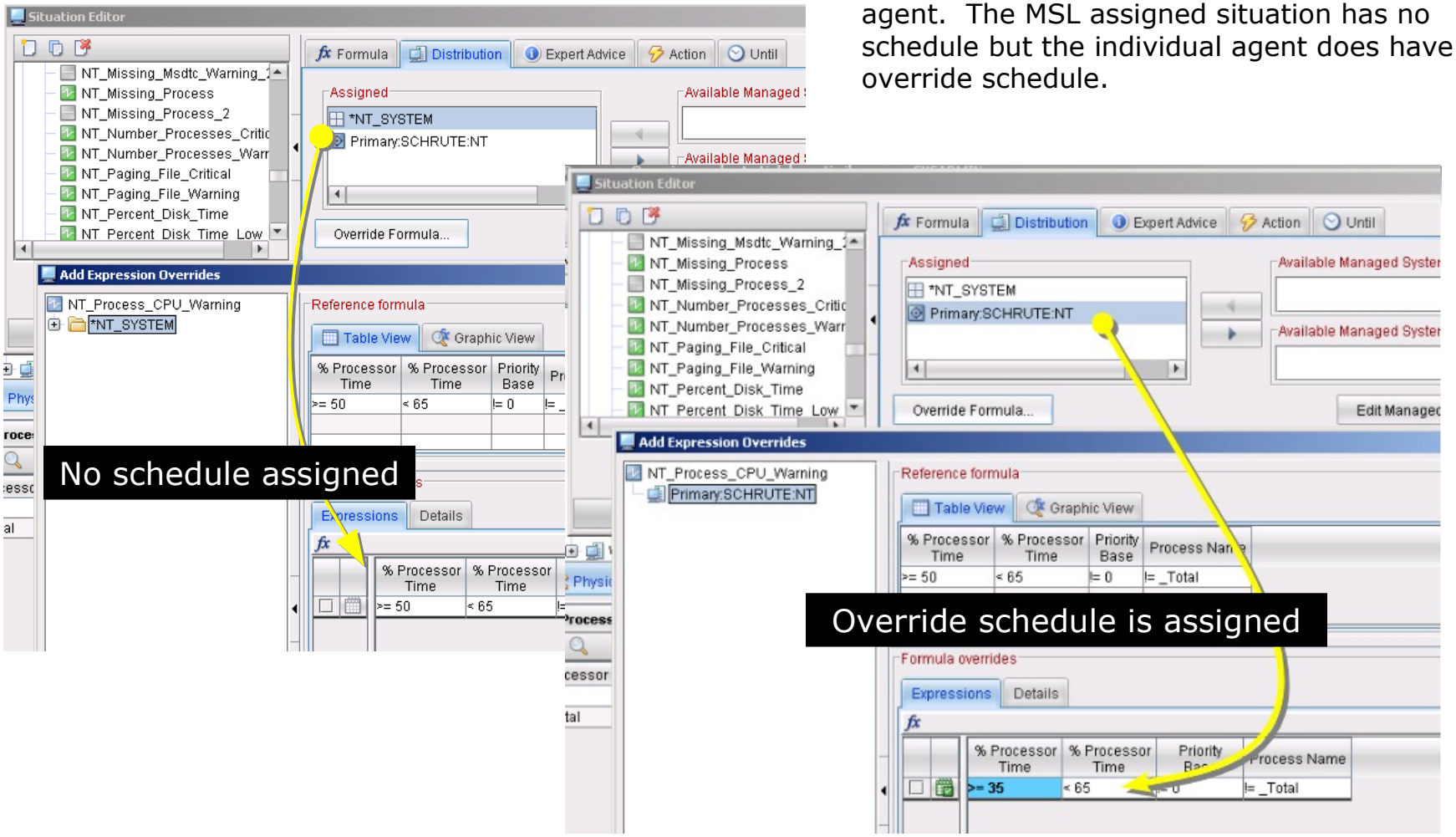
Override Example

Notice the same situation is twice distributed to an agent from an MSL and to the individual agent. The MSL assigned situation has no schedule but the individual agent does have an override schedule.



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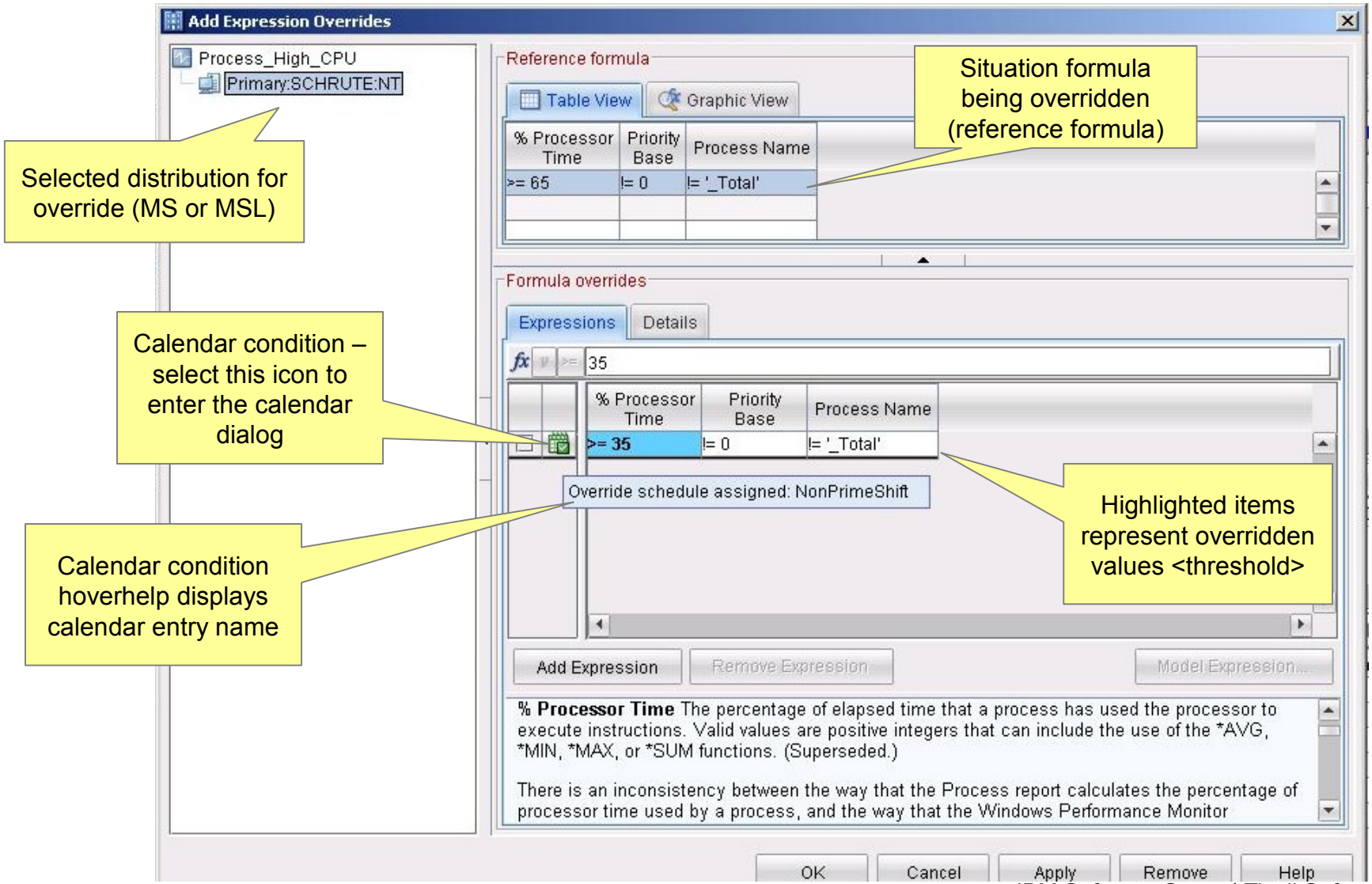
Situation Override Editor



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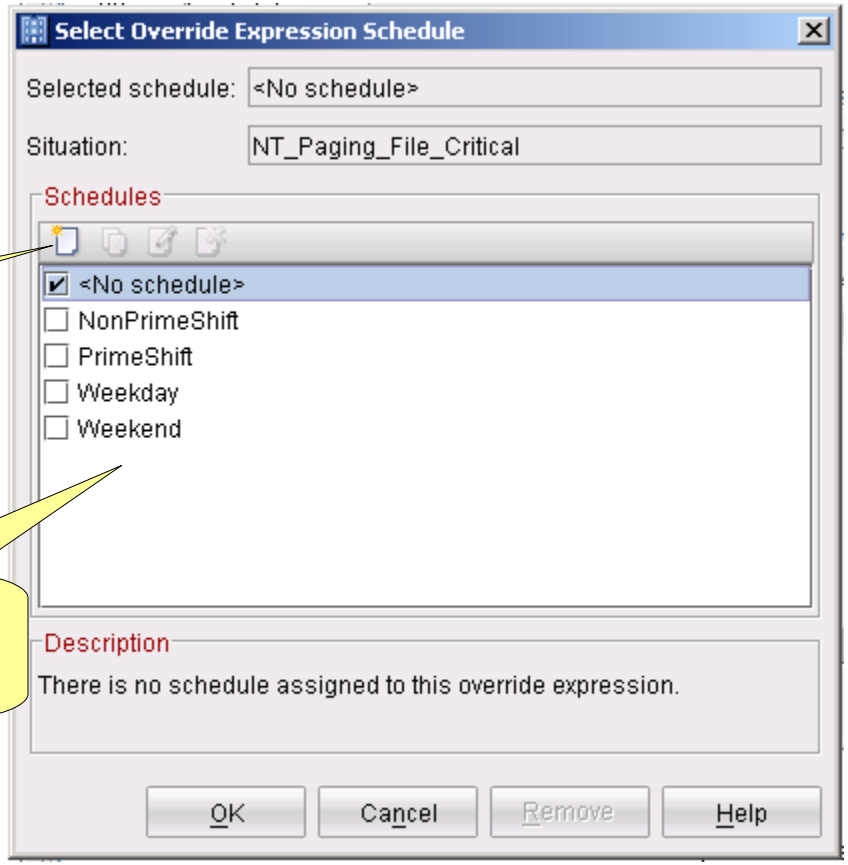
Schedule Dialog

- Access this window from the calendar icon on previous slide



Select the "Create New Schedule" button in upper left corner

Four default schedules listed

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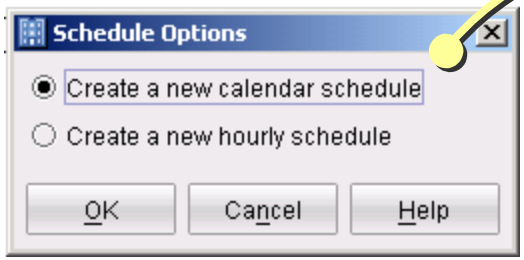
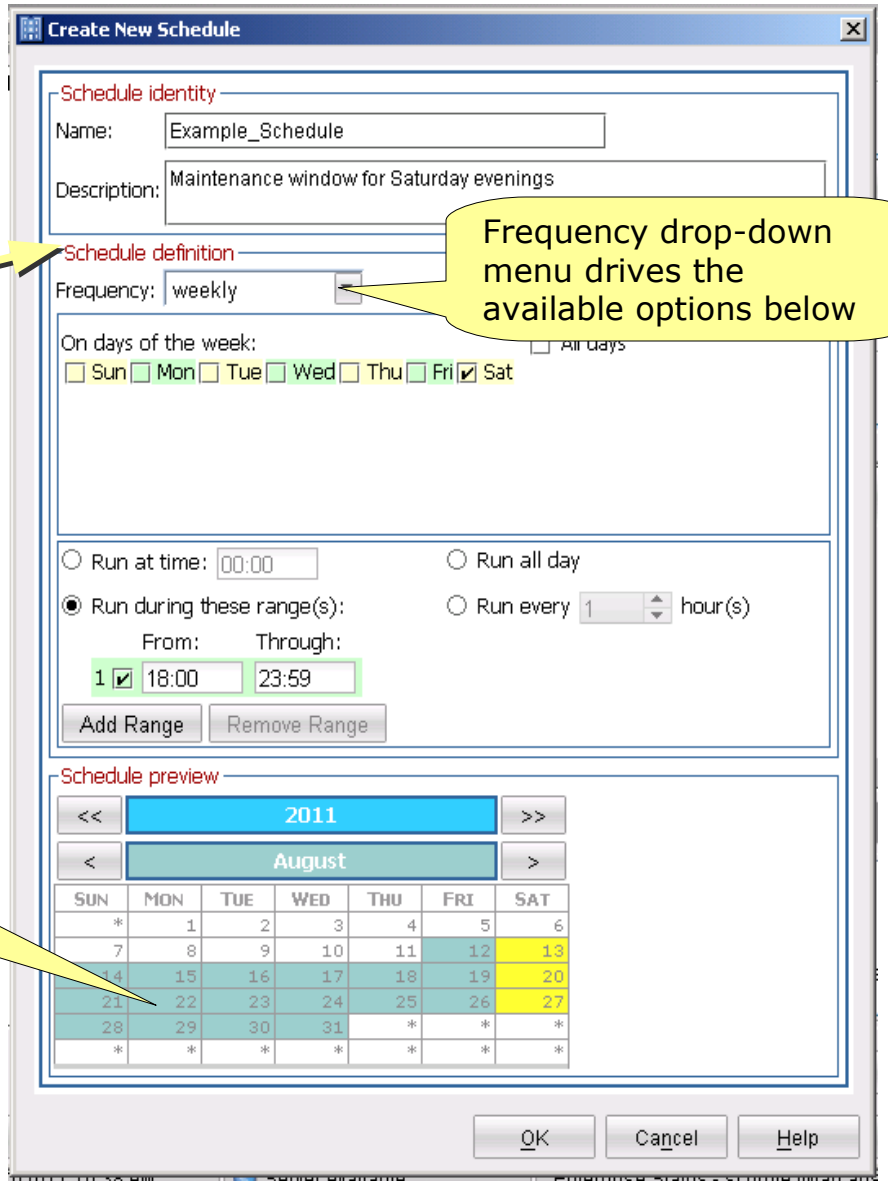
New calendar schedule dialog





Frequency drop-down menu drives the available options below

Color changes driven by choices. Yellow entry is an affected day.

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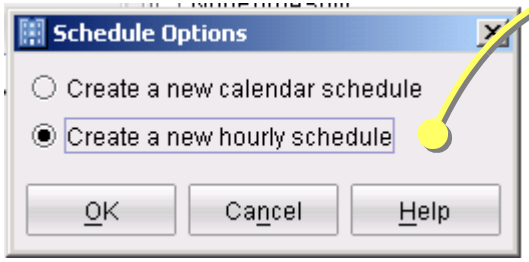
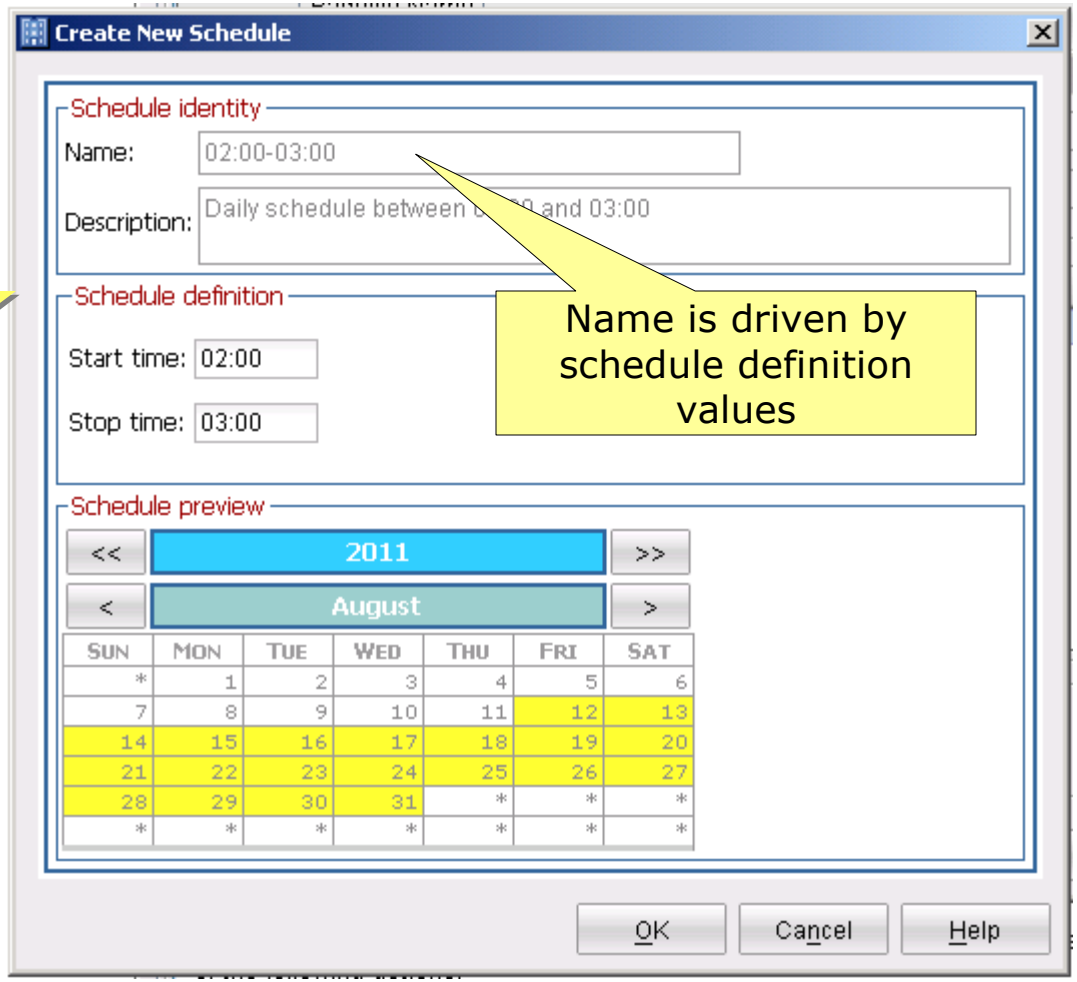
New Hourly Schedule Dialog





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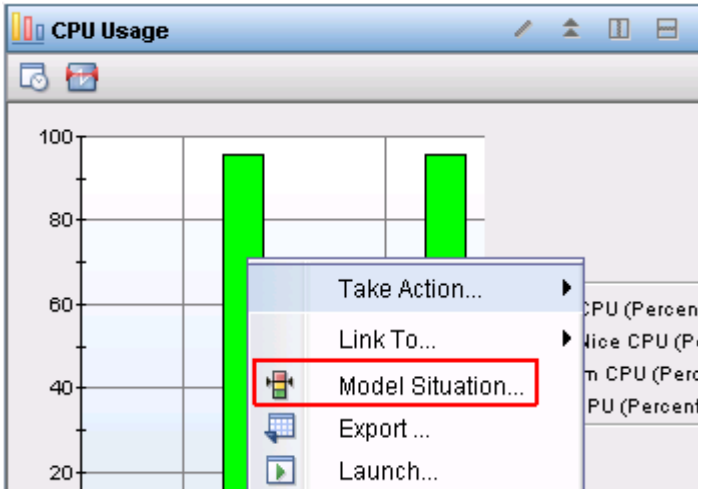
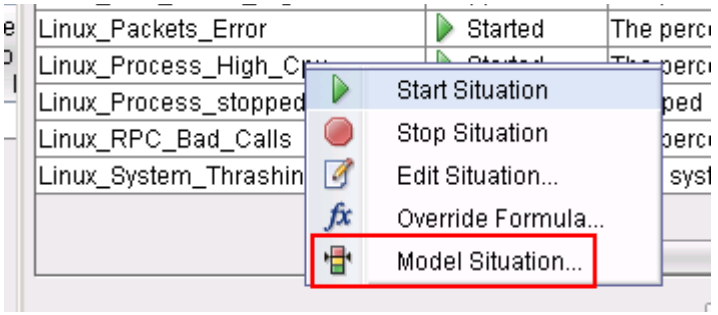
Enter Situation Modeling Dialog

- Right-click data in a chart or table
  (Good for creating a new situation)



- Right-click a situation in the Manage Situations window



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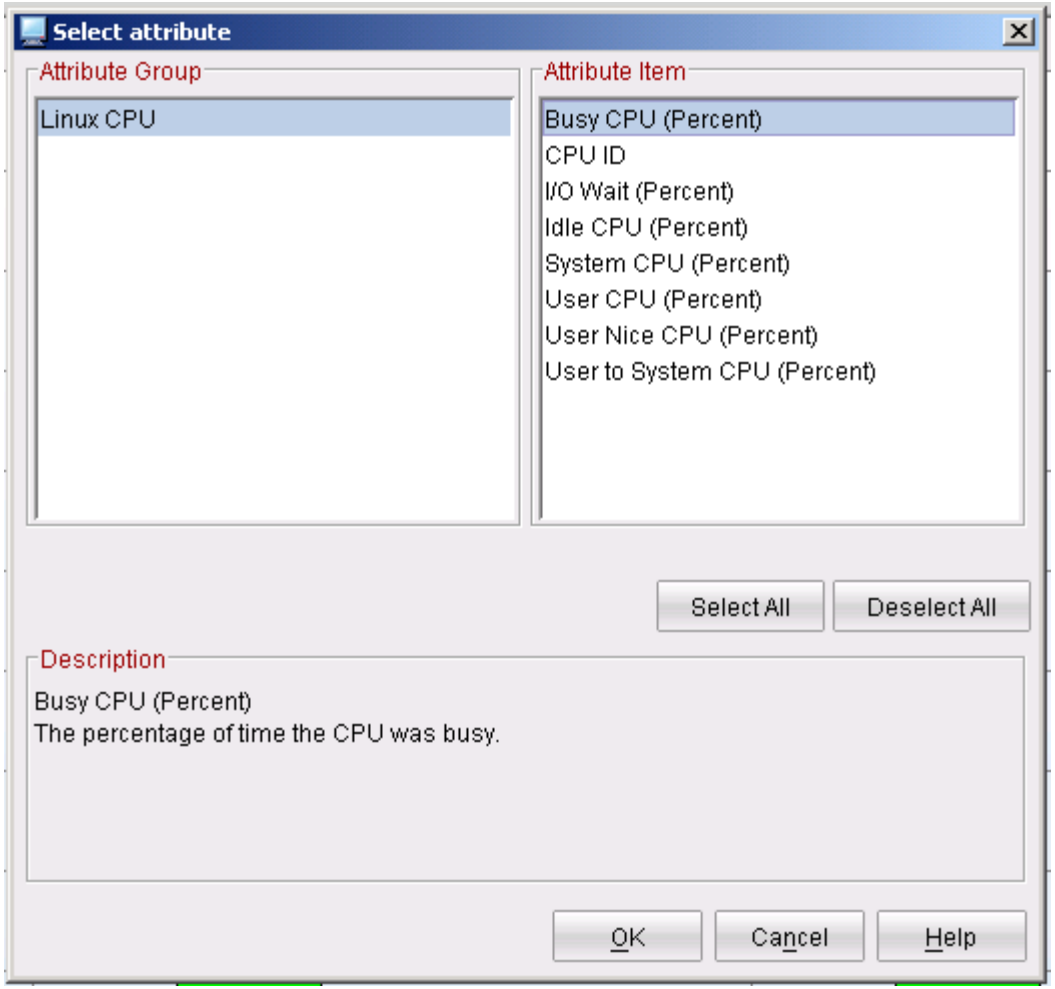
Create new situation from table or chart



- Select one or more attributes

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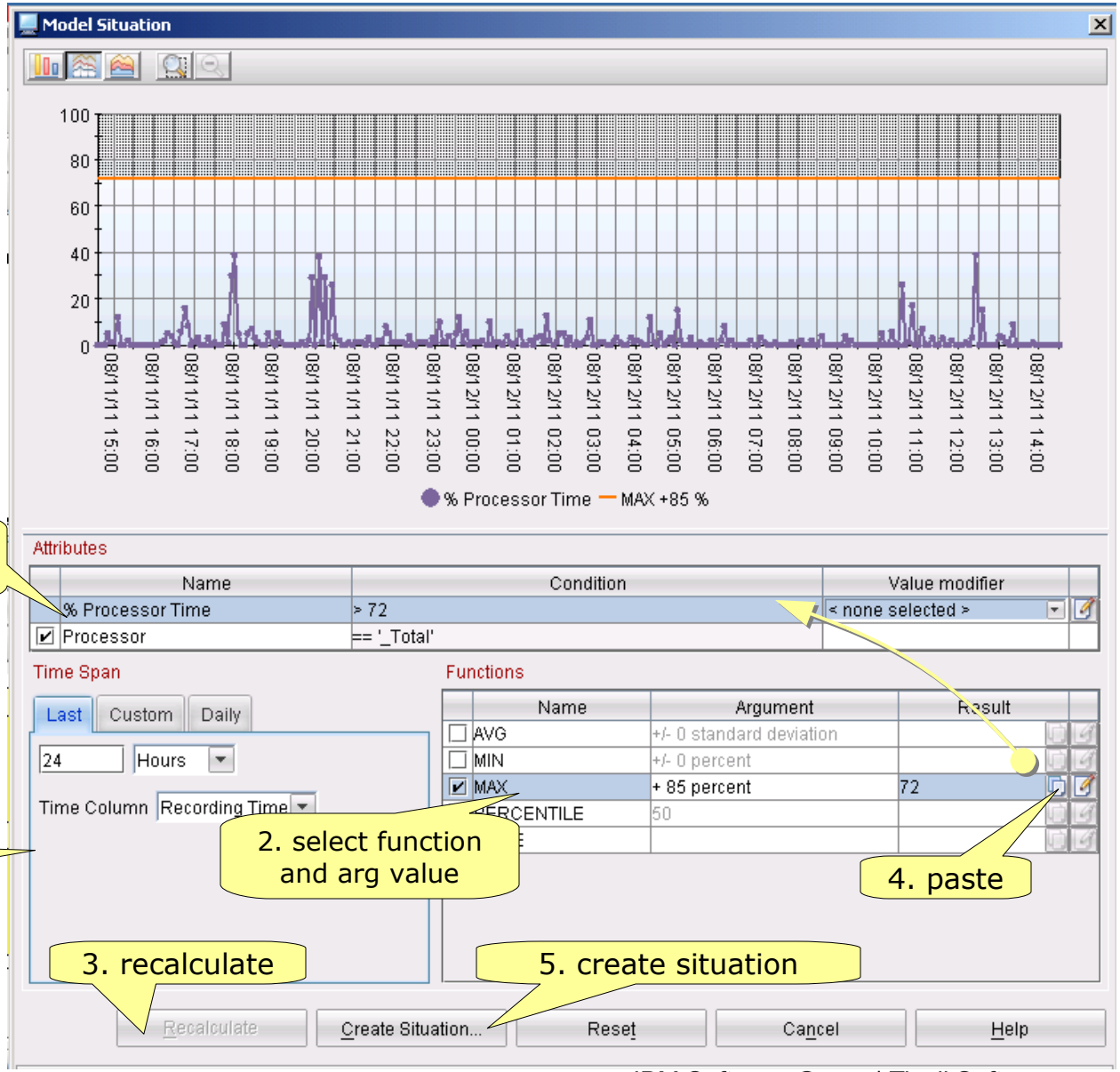
Model Situation Dialog



1. select attribute

Change Time Span options here

2. select function and arg value

3. recalculate

4. paste

5. create situation

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Centralized Management of Dynamic Thresholds

- Calendar entries
  - stored in O4SRV.TCALENDAR table on the TEMS
  - Distributed by the TEMS to every override-enabled agent's override XML file every time a calendar entry is added, modified, or deleted
- Overrides
  - stored in the O4SRV.TOVERRIDE, O4SRV.TOVERITEM tables on the TEMS
  - distributed by the TEMS to each *impacted* agent every time an override is added, modified, or deleted (for MSL-level overrides, the overrides are distributed to every override-eligible agent in the MSL)

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Agent Override XML Files

- Each agent's override XML file is located in the TMAITM6 directory
  - naming convention: <pseudo_MSN>_THRESHOLDS.XML
  - colons (:) in MSN replaced by underscores (_), e.g. "Primary_LEVER_NT_THRESHOLDS.XML" for MSN "Primary:LEVER:NT", "Lever_UA_THRESHOLDS.XML" for MSN 'Lever:UA"
- Agent reads the file during startup, when file is updated
- Contains calendar entries defined on the TEMS
- Contains all dynamic thresholds set for that managed system *or* the managed system list that the managed system belongs to
  - Dynamic thresholds set for the *MSN* (priority=100) take precedence over dynamic thresholds set for the *MSL* (priority=200) that the MSN belongs to
- Each file contains a checksum
- Any manual user edits to the file will be *lost* when the agent is restarted or when a calendar entry or override change notification occurs

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Agent Override XML File - example

```
<?xml version="1.0"?>
<overrides>
   <calendar name="NonPrimeShift" cron="* 0,1,2,3,4,5,6,7,8,17,18,19,20,21,22,23 * * 1-5"
      lastupdate="10810252101500000" ></calendar>
   <calendar name="PrimeShift" cron="* 8-17 * * 1-5" lastupdate="10810252101490000" ></calendar>
   <calendar name="Weekday" cron="* * * * 1-5" lastupdate="10810252101490000" ></calendar>
   <calendar name="Weekend" cron="* * * * 0,6" lastupdate="10810252101490000" ></calendar>
   <calendar name="Z90B87E74CD22529992ABC57FC2A3341" cron="* 8-9 * * 1-5"
      lastupdate="10810311634150000" ></calendar>
   <calendar name="Z90B88BA4F834032D8E42BD744EAF466" cron="* 9-10 * * 1-5"
      lastupdate="10810311637460000" ></calendar>
   <calendar name="Z90B88BB4F866A2F5357622A35BE5E06" cron="* 10-11 * * 1-5"
      lastupdate="10810311637470000" ></calendar>
   <calendar name="Z90B88BC4F89142B191F402A5E096D5C" cron="* 11-12 * * 1-5"
      lastupdate="10810311637480000" ></calendar>
   ...
```


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Agent Override XML File - example (continued)

```
<situation name="Process_High_CPU" priority="100"
    OBJNAME="Process_High_CPE97BD8763CAC42B4" >
  <key column="INSTCNAME" value="java">
    <threshold column="PCTPRCSTME" value="95" operator="GT" ></threshold>
  </key>
  <key column="INSTCNAME" value="kdsmain">
    <threshold column="PCTPRCSTME" value="25" operator="GT" ></threshold>
  </key>
  <default>
    <threshold column="PCTPRIVTME" value="40"
      calendar="Z90B87E74CD22529992ABC57FC2A3341" operator="GT" ></threshold>
    <threshold column="PCTPRCSTME" value="80"
      calendar="Z90B87E74CD22529992ABC57FC2A3341" operator="GT" ></threshold>
    </default>
</situation>
<situation name="Process_High_CPU" priority="200"
    OBJNAME="Process_High_CPF78184522FDD481F" >
  <threshold column="PCTPRCSTME" value="80"
calendar="Z90B88BD4F8D3E285EE71E296537CB36"
      operator="GT" ></threshold>
</situation>
</overrides filesum=32674 >
```

MSN-level override

MSL-level override

File Checksum

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Troubleshooting Dynamic Thresholding - Agent Level

- If calendar entries or situation overrides don't appear to be getting to the agent (e.g. aren't showing up in the agent's override XML file), check the agent's operations log
  - Calendar and threshold adds/deletes/updates appear in the operations log
  - Ops log entries are made by default, no tracing levels necessary
  - Ops log file location:
    - %CANDLE_HOME%\TMAITM6\logs\<pseudo_MSN>.LG0 (Windows)
      e.g. C:\IBM\ITM\TMAITM6\logs\Primary_LEVER_NT.LG0
    - $CANDLEHOME/logs/<MSN>.lg0
      e.g. /opt/IBM/ITM/logs/lever:lz.lg0

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Troubleshooting Dynamic Thresholding - Agent Level

- If a dynamic threshold appears in the agent's override XML file, but doesn't appear to be working properly, set the following trace for the agent:

  ERROR(UNIT:krathagt ALL) (UNIT:kracaagt ALL) (UNIT: kraacth ALL)

- Agent log file location:
  - %CANDLE_HOME%\TMAITM6\logs*_nt_kntcma_*.log (Windows)
    e.g. C:\IBM\ITM\TMAITM6\logs\LEVER_nt_kntcma_490b3b06-01.log
  - $CANDLEHOME/logs/*_lz_*.log (Linux)
    (e.g. /opt/IBM/ITM/logs/lever_lz_klzagent_48738dc6-01.log
  - $CANDLEHOME/logs/*_ux_*.log (Unix)
    (e.g. /opt/IBM/ITM/logs/lever_ux_kuxagent_72184a3e-01.log

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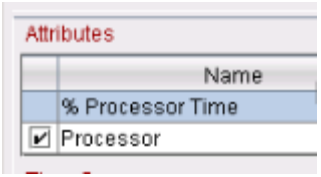
Technotes & APARs

- Situation Override length is limited to 4,000 bytes and no check exists in the TEP client. Error appears in TEMS log:
  - (4C59FF0A.0000-6:ko4ovrd.cpp,168,"Override::Override") Error: Override
  - <IBM_check_ovr__3A44FD0A864C4350> sit <IBM_check_ovr> si
  - +4C59FF0A.0000 ze <5062> exceeds limit 4000
- In 6.2.1, situation overrides were distributed to all subnode agents. Fixed in 6.2.2.
- IZ95498 Document - Wildcards in the key value of the formula are not supported. Key values are listed with check marks to the left of the attribute name.



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CLI commands

Commands introduced in ITM 6.2.1:

Calendar Management
- addcalendarEntry
- editCalendarEntry
- deleteCalendarEntry
- viewCalendarEntry
- listCalendarEntries
- exportCalendarEntries
- importCalendarEntries

Override Management
- listOverrideablesits
- listSitAttributes
- listOverrides
- setOverride
- deleteOverride

Univariate Baselining
- suggestBaseline
- acceptBaseline

http://publib.boulder.ibm.com/infocenter/tivihelp/v15r1/index.jsp?topic=%2Fcom.ibm.itm.doc_6.2.2fp2%2Ftacmd.htm&path=3_0_5_0_2

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Script to update thresholds

- OPAL solution is a script that automates the process of updating the Dynamic Thresholds
  - https://www-304.ibm.com/software/brandcatalog/ismlibrary/details?catalog.label=1TW10TM7F#

- The tool evaluates the situations and determines which situations are already configured for dynamic thresholds. If the situation has overrides defined, then the tool will run using provided criteria and update the override settings. For example, the script will re-evalute the recent historical data and update the threshold for one standard deviation.

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Demo and Questions

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Backup Slides

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Out-of-the-Box Calendar Entries

These calendar entries ship with ITM 6.2.1:

- PrimeShift

  Monday to Friday between 8am and 5pm

  * 8-17 * * 1-5

- NonPrimeShift

  Monday to Friday before 8am and after 5pm

  * 0,1,2,3,4,5,6,7,8,17,18,19,20,21,22,23 * * 1-5

- Weekday

  Monday to Friday

  * * * * 1-5

- Weekend

  Saturday and Sunday

  * * * * 0,6

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CRON Format

Cron format is a simple, yet powerful and flexible way to define time and frequency of various actions. For the calendarentry commands, the data has to be specified in CRON format with **–c|--cron** option.

Traditional CRON format (supported by CLI) consists of five fields (quintuple value) separated by white spaces in the following order :
<Minute> <Hour> <Day_of_the_Month> <Month_of_the_Year> <Day_of_the_Week>

NOTE: The order is important in CRON spec. eg : <Hour> <Month> <Minute> <Day_Of_Month> <Day_Of_ Week> is invalid.

The following graph shows what it should consist of:

```
* * * * *
| | | | |     ATTRIBUTE           VALID VALUES
| | | | +--→ Day of the Week    (range: 0-7) 0 and 7 stands for Sunday
| | | +----→ Month of the Year  (range: 1-12)
| | +------→ Day of the Month   (range: 1-31)
| +--------→ Hour               (range: 0-23)
+----------→ Minute             (range: 0-59)
```

NOTE: In Month and Day_of_Week fields, you can use name of month or day of week abbreviated to first three letters (Jan,Feb,...,Dec or Mon,Tue,...,Sun) instead of their numeric values. **But in that case, the user can specify ONLY one value. List and range of values are not allowed**. Eg “JAN,MAR” cannot be given.

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CRON Format

There are several ways of specifying multiple date/time values in a field :

The comma (**,**) operator specifies a list of values, for example: "1,3,4,7,8"

The dash (**-**) operator specifies a range of values, for example: "1-6", which is equivalent to "1,2,3,4,5,6"

The asterisk (*****) operator specifies all possible values for a field. For example, an asterisk in the hour time field would be equivalent to 'every hour' (subject to matching other specified fields).

There is also an operator which some extended versions of cron support, the slash (/) operator (called "step"), which can be used to skip a given number of values. For example, */3 in the hour time field is equivalent to "0,3,6,9,12,15,18,21". So * specifies 'every hour' but the */3 means only those hours divisible by 3.

addCalendarEntry and editCalendarEntry both take either a compact cron spec in standard format (with –c|--cron option), or named arguments giving each element of the cron spec by name. ie, If -c|--cron option is not used, the cron data can also be given using one or more of the (-i|--min; -h|--hour; a|--daym|--dayofmonth; -m|--month; -w|--dayw|--dayofweek) options. Missing named arguments default to the value ‘ * ’.

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