Manage time zones with Tivoli Workload Scheduler

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Manage time zones with Tivoli Workload Scheduler

- IBM® Tivoli® Workload Scheduler (TWS)
  - ▶ Manages workloads across time zones
  - ▶ Manages simple or complicated job times in different time zones
  - ▶ Sets the global options to enable time zone management

- Workstation definitions contain time zone configurations

- Job streams use those time zones or others if needed

Tivoli Workload Scheduler manages the workload for worldwide enterprises that span multiple time zones and offers 24-hour business continuity. In this presentation, you will learn how Tivoli Workload Scheduler can schedule work in any time zone and how a user defines and monitors that work.

Introduction

- Tivoli Workload Scheduler manages time dependencies
  - Workstations
  - Job streams
  - Jobs
- Times managed
  - Estimated start time
  - Latest start time
  - Actual start time
  - Estimated deadline time
  - Actual completion time

Tivoli Workload Scheduler manages the time dependencies for each workstation, job stream, and job in the execution plan. With time zone management enabled, the estimated start time, latest start time, actual start time, estimated deadline time, and actual completion time is managed according to the time zone where the work was planned and run.

Why manage time zones
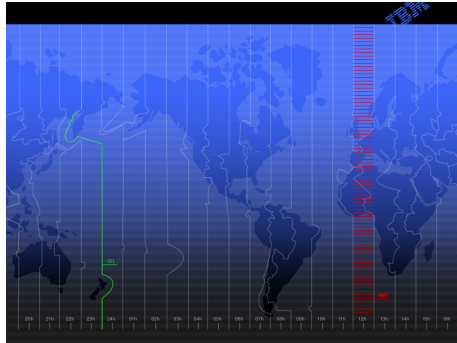
- No need to rely on the agent to manage time dependencies

- Schedule work at any time of the day

- Use any of the over 500 time zones around the world

- View from a single location what time a job starts

- Time dependency automatically converted to local time

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Early versions of Tivoli Workload Scheduler did not support scheduling in time zones. The physical installation of the agent managed the time dependencies. Today, a set of features is available for scheduling work at any time of the day in any of the over 500 time zones around the world. If your organization spans more than one time zone, you can enable and use time zones in your workload definitions. By using time zones, you can view from a single location what time a job or job stream will start or complete without converting the time dependency to local time.

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How Tivoli Workload Scheduler manages time zones

Two configurations

- ▶ Enable time zones
- ▶ The time zones in workstation and job stream definitions

ENABLE_LEGACY_STARTOFDAY_EVALUATION	YES
PREVENT_START	YES
START	0600
TIMEZONE_ENABLE	YES

The time at which the jobs and job streams you create in Tivoli Workload Scheduler will run depends primarily on these two configurations within TWS:

One, the Enable time zones setting, which tells TWS whether or not to manage the time dependencies internally, and

two, the time zones set within the TWS workstation or job stream definitions.

Without time zone management

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To gain a better understanding of the benefits of time zone management, note what happens in TWS if time zone management is not enabled.

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Without time zones

- Jobs run only according to the local time on the agent

- Specified time zones are disabled or ignored

- Workstation time zones have no effect

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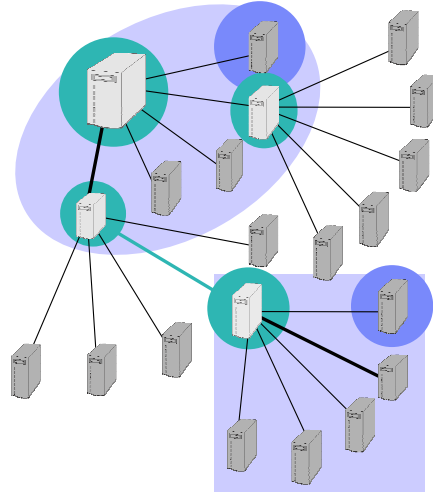
If the TWS Global Option Enable Time Zones is not set, TWS jobs run only according to the local time on the TWS Fault Tolerant Agent on which the job stream runs. Any time zone specified in the job stream definition is disabled or ignored. You can configure the time zone of each workstation, but this configuration has no practical effect unless you enable time zone management.
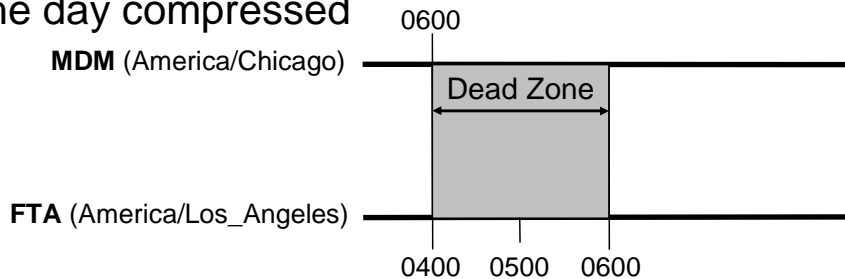
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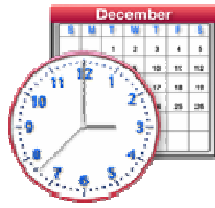
Relative times

- A job stream with an earliest start time of 10:00 a.m. starts at 10:00 a.m. local time on the agent

- The start time at your location is relative to the time zone difference

If a job stream has an earliest start time of 10:00 a.m., that job stream will start at 10:00 a.m. local time on the agent for which the job stream is defined. If the agent is in a time zone east of your location, you would see that the job stream is set to run at 10:00 a.m., but in your local time it would start running at 9:00 a.m.. As you manage work in more time zones, this becomes confusing.

Tivoli Workload Scheduler scheduling dead zone

- Without time zone management a dead zone is created

- No job streams can run in the dead zone

- Later workstations, further east, have the beginning of the day compressed

0600

MDM (America/Chicago)

Dead Zone

FTA (America/Los_Angeles)

0400   0500   0600

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Because of the way TWS initializes the scheduling plan each day, all workstations in the TWS network receive a new plan. This new plan, called the Symphony™ file, occurs at the same moment in time at each workstation. Without time zone management, the TWS master domain manager does not know that agents west of the master have not completed their full scheduling cycles. The TWS master domain manager initializes these agents with a new Symphony file before the scheduling day is complete.

This situation creates a dead zone in which no job streams can be scheduled. Before the defined earliest start time elapses, a new Symphony file arrives. At the same time, agents further east than the master domain manager have all job streams in the first hours of the scheduling day compressed in time to those first hours. By the time they have received the new Symphony file, at least one hour has already passed. Having seen the earliest start times of the first job streams in the day already expired, those streams start immediately upon receiving the new plan.
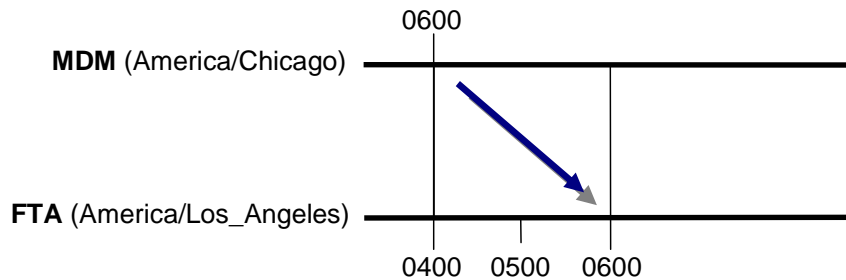
With time zone management

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Next consider how TWS works when the Time Zone option is enabled.

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With time zones

- Tivoli Workload Scheduler understands the relative time of the workstations

- Time dependencies align to the correct processing day for each workstation

- The dead zone is eliminated

```
                        0600
MDM (America/Chicago) ──┼───────────┼──────

FTA (America/Los_Angeles) ──┼──────┼──────┼──────
                        0400  0500  0600
```

By enabling TWS time zone management, the master domain manager understands the relative time of day of all the workstations in the TWS network. The master domain manager can offset the time dependencies of the job streams to align them to the correct processing day for each workstation. This offset eliminates the previously mentioned dead zone by aligning work to the correct plan production day. For example, work that would have been squashed at the end of the plan in a western agent is moved to the beginning of the following plan day to align with the relative TWS start of day.

Daylight savings time

- When Daylight Savings Time (DST) starts at 2:00 a.m.
  - ▸ Job streams scheduled to start between 1:00 a.m. and 1:59 a.m. are set to start at 2:00 a.m.
  - ▸ Otherwise job streams start immediately because 2:00 a.m. is later than their scheduled start times
- Tivoli Workload Scheduler ensures that the job stream instances (planned to run during the hour before the time shift backward) are run only once

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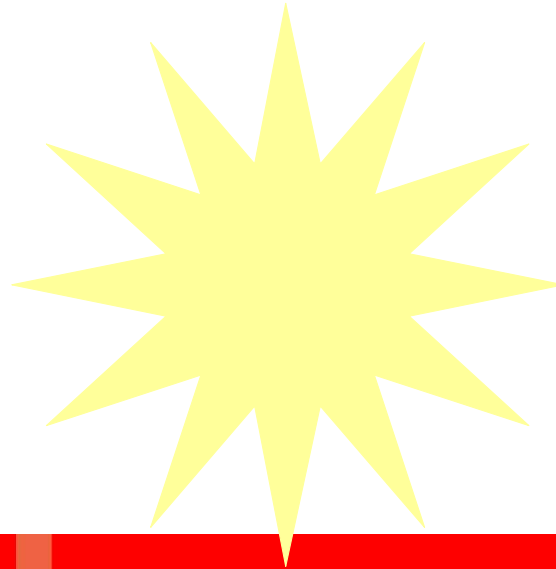
Tivoli Workload Scheduler manages the moving from standard time to daylight savings time when generating the production plan. In the plan, the date and time to run the jobs and job streams is already converted into the corresponding date and time with daylight savings time on.

For example, if daylight savings time is switched on at 2:00 a.m., then job streams scheduled to start between 1:00 a.m. and 1:59 a.m. are set to start at 2:00 a.m.. At 1:00 a.m. the clock time is moved one hour ahead because daylight savings time is switched on. All job streams planned to start between 1:00 a.m. and 1:59 a.m., if free from other dependencies, start immediately because 2:00 a.m. is later than their scheduled start times.

Moving from daylight savings time to standard daylight time, the clock is set to one hour earlier to accommodate daylight savings time. Tivoli Workload Scheduler maintains consistency with production planning criteria. TWS ensures that the job stream instances that are scheduled to run (during the hour before the time shifts backward) are run only once. The time conversion is applied when generating or extending the production plan. The date and time to run jobs and job streams is already converted into the corresponding date and time in standard daylight time.
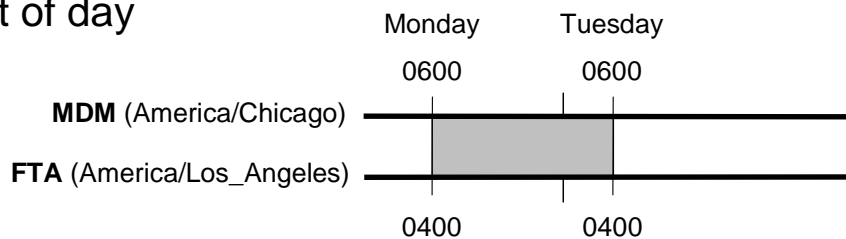
Global configuration

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The TWS administrator sets global configurations so that TWS can manage work in different time zones.

Start of day

- startOfDay sets the start time of the processing day

- The default value is 0600

- Change the launch time of the final job stream if you change this default (optional)

- Job stream run cycles are scheduled relative to the start of day


```
                        Monday          Tuesday
                         0600            0600
MDM (America/Chicago) ─────┬───────────────┬─────────
FTA (America/Los_Angeles) ─┴───────────────┴─────────
                         0400            0400
```

The startOfDay global option sets the start time of the processing day.

Specify the start time of the Tivoli Workload Scheduler processing day in 24-hour format: hhmm (0000-2359). The default value is 0600, 6:00 a.m. If you change this option, you must also change the launch time of the FINAL job stream, which is usually set to one minute before the start time: 0559, 5:59 a.m. You do not need to align the start of day with the scheduled running of the FINAL job stream, but this alignment is still a good practice.

Job stream run cycles are scheduled relative to the start of day.

Enable time zones

- TimeZone_Enable must be set to yes

- optman chg enTimeZone=yes

ENABLE_LEGACY_STARTOFDAY_EVALUATION   YES
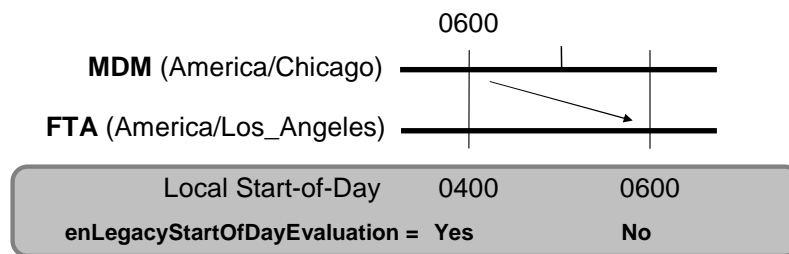PREVENT_START   YES
START   0600
TIMEZONE_ENABLE   YES

The global option Enable Time Zones must be set to *yes* to use TWS time zone management. Use the **optman** command to change global options. For example: optman change enable time zones = yes

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Legacy time zones

The enLegacyStartOfDayEvaluation setting changes how TWS agents evaluate the start-of-day time

▸ Yes: startOfDay is converted to the local time zone set on each workstation

▸ No: startOfDay is applied as is on each workstation

```
                                    0600
                                     |         |
MDM (America/Chicago) ━━━━━━━━━━━━━━━┿━━━━━━━━━┿━━━━━━━━
                                       ╲
FTA (America/Los_Angeles) ━━━━━━━━━━━━━┿━━━━━━━➤┿━━━━━━━
                                       |         |
```

Local Start-of-Day	0400	0600
enLegacyStartOfDayEvaluation =	**Yes**	**No**

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The enable Legacy Start of Day Evaluation global option setting changes how TWS agents evaluate the start-of-day time. If you set this option to yes, the start Of Day value on the master domain manager is converted to the local time zone set on each workstation across the network. If you set this option to no, the start Of Day value on the master domain manager is applied as is on each workstation across the network. This option requires that the enable Time Zone option is set to yes to become operational.

Enable prevent start

- Production plans can span multiple days, for example 72 hours

- An artificial start time of start of day is applied to job streams without a time dependency

- Prevents daily job streams without time restrictions from running as soon as the plan is generated

- optman chg enPreventStart = yes

MO	TU	WE	TH	FR	SA	SU
				obStreamA	JobStreamA	JobStreamA

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In TWS 8.3 and newer you can create production plans, the Symphony files, that span multiple days. In some environments, for example, you might want a production plan that spans 72 hours, from Friday until Monday. The prevent start global option applies an artificial start time to any job stream that does not have a time dependency. This start time is equivalent to the daily start of day configuration. For example, in a 72-hour plan, this setting prevents all of the daily job streams that did not have time restrictions from running as soon as the plan was generated on Friday by applying start times for Saturday and Sunday job stream instances.

Time zone settings

- You can use time zone settings in workstation, job, and job stream definitions

- Tivoli Workload Scheduler converts time dependencies and time zones internally into object definitions using Greenwich Mean Time (GMT)
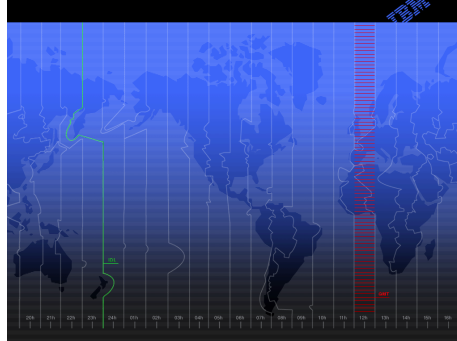
When the time zone is enabled, you can use time zone settings in workstation, job, and job stream definitions.

While performing plan management activities, Tivoli Workload Scheduler converts the value set for time dependencies and time zones into object definitions. The conversions are applied in the following order:

•When job stream instances are added to the preproduction plan, any time zones set in the job stream definitions are converted to GMT. Then, external dependencies are resolved.

•When the production plan is created or extended, job stream instances are assigned to workstations where the instances are scheduled to run, and the time zone is converted from GMT into the time zone set in the target workstation definition.

Workstation configuration

- Each workstation has a time zone setting

- Always configure time zones if enabled

- Variable length and 3-character notations are supported

- Variable length notation is preferred

America/Chicago   Europe/Paris

America/Arizona

America/Los_Angeles
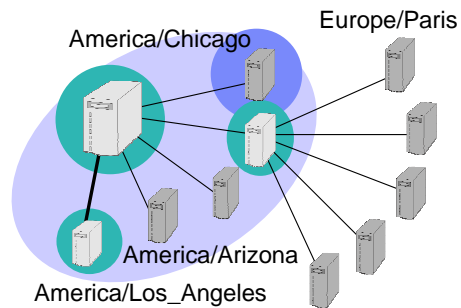
Each workstation in the TWS network has a time zone setting. This setting should always be configured if time zone management is enabled. Both the 3-character and the variable length notations are supported. The 3-character notation is supported for backward compatibility with previous versions of Tivoli Workload Scheduler. The variable length notation format is area/city, for example Europe/Paris is equivalent to European Central Time, ECT. This notation is the preferred notation.

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Comparison to actual system clock
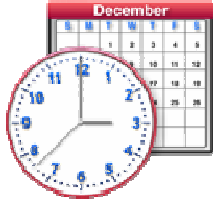
- Time zone in the workstation definition should match the system time

- The system clock on each agent is used to resolve time dependencies

- If the times do not match, jobs might run at the incorrect time

The time zone in the workstation definition should match the system time on the machine where the workstation is defined. This match must exist even if that system does not reside in the physical location of the time zone for which it is configured. The system clock on each TWS Fault Tolerant Agent will be used for resolving time dependencies on jobs and job streams planned for that workstation.

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Job stream definition

- Any job stream will run in the time zone defined for its workstation

- No time zone setting within a job stream is necessary

- Run work in a different time zone by setting the time zone in the job stream definition

By default, any job stream defined for a workstation will run in the time zone defined for that workstation; thus, no time zone setting within a job stream is necessary. You can run work in a different time zone than the workstation's configuration by setting the time zone in the job stream definition. The time zone defined for the job stream determines the time at which any time-related dependencies are satisfied.

Viewer definition

- The Tivoli Dynamic Workload Console offsets each time shown

- Times are aligned to your local time setting

The **conman showscheds** or **conman showjobs** commands display the time zone values from the workstation where the job or job stream is planned to run

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As mentioned before, when the production plan is created, the planner converts any time zones into local times defined for the workstations. If you use the **conman show schedules** or **conman show jobs** commands to see the information about scheduled jobs and job streams, you see the time zone values expressed using the time zone set on the workstation where the job or job stream is planned to run.

Viewer definition

Select your time zone viewing from the portfolio (Settings > Manage User P...

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The graphical user interfaces, such as the Tivoli Dynamic Workload Console, accommodate for the different time zones defined in the environment. The GUIs also offset each time shown in the monitoring process to show you the time as aligned to your local time. You do not need to convert the time you see to another time zone. To set your time zone viewing, open the Workload Console and select **Settings > Manage User Preferences** from the portfolio on the left. Then, on the Manage User Preferences panel, click the **Edit** button to reveal the date/time options. Here you can choose in which time zone you would like to view all time-related information in the Workload Console.

Examples

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On the following slides are some examples using time zones in different ways.

Examples

	Link Status ^	Workstation ⌃	Jobman Running ^	Time Zone ^	Start Time ^	Writer Running ^	Run Number ^	Limit ^	Domain ^
☐	⚡ LINKED	ARIZONA	🟩 Yes	America/Phoenix	2/25/09 6:59 AM CDT	🟩 Yes	69	10	MASTERDM
☐	⚡	CENTRAL	🟩 Yes	America/Chicago	2/25/09 5:59 AM CDT		69	10	MASTERDM
☐	⚡ LINKED	EASTERN	🟩 Yes	America/New_York	2/25/09 5:59 AM CDT		69	10	MASTERDM
☐	⚡ LINKED	PACIFIC	🟩 Yes	America/Los_Angeles	2/25/09 5:59 AM CDT		69	10	MASTERDM

- The master domain manager, Central, is in the Central U.S. time zone
- The time zone setting is America/Chicago
- The other workstations are:
  - Arizona, in America/Phoenix time zone (does not change its time for daylight savings)
  - Eastern in America/New_York
  - Pacific in America/Los_Angeles

Explore a couple of examples. In the network, the Workload Scheduler master domain manager is in the Central U.S. time zone, or GMT minus 6. The time zone for the master workstation is set to America/Chicago. You have three other workstations in the network. Arizona, which is in the America/Phoenix time zone, Eastern, which is in America/New_York, and Pacific, which is in America/Los_Angeles. Keep in mind, Arizona does not change its time for daylight savings.

For the examples, you will create the job streams and demonstrate what appears in Workload Scheduler's forecast of different dates.

Scenario 1: Same local time

Properties - Job Stream - **ARIZONA#T1000LOCAL**

General | Scheduling options | Time restrictions | Dependency resolution

Time zone:
None

Earliest start
☑ Use as time dependency
Time: Delay for days:
10:00 AM   0

Latest start
Time: Delay for days: Action:
                                                  Suppress

Deadline
Time: Delay for days:

- Schedule a job at 10:00 a.m. in each time zone using one of the following methods:
  ‣ Use a single job stream for all four jobs
  ‣ Use four job streams, one for each workstation, each with a single job (preferred method)
- Create four job streams, each setting the earliest start time to 10:00 a.m., insert the job, and save it

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In the first example, schedule a job at the same local time in each time zone. You want this job to run at 10:00 a.m. local time on four machines. You can achieve the task in several ways by using a single job stream for all four jobs, or four job streams, each with a single job.

In the first example each job stream inherits its time zone from the workstation on which it resides. Create each job stream, setting the earliest start time to 10:00 a.m., insert the job, and save it. When you view the job streams in a forecast or production plan, you will notice that they run at different times.

Scenario 2: Same Universal Time

Properties - Job Stream - **ARIZONA#T1000CST**

General | Scheduling options | Time restrictions | Dependency resolution

Time zone:
Chicago - Central Standard Time (GMT-6:00)

Earliest start
☑ Use as time dependency

Time:
10:00 AM

Delay for days:
0

Latest start

Time:

Delay for days:

Action:
Suppress

Deadline

Time:

Delay for days:

- Run simultaneously on four servers in four different time zones
- Set the time zone based on the Central time zone and let Tivoli Workload Scheduler figure out the differences

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In the second scenario, you have a job running simultaneously on four servers in four different time zones. If you try to accomplish this by calculating the local time, you will unnecessarily complicate matters. You might even forget that the times will change in March and November when only three of the four machines will honor daylight savings time. Instead, set the time based on the Central time zone and let TWS figure out the differences on different workstations.

Compare the results of forecast plans (Standard time)

	Job Stream ▲	Workstation ^	Scheduled Time ^	Earliest Start ^
☐	FINAL	CENTRAL	3/7/09 5:59 AM CDT	3/7/09 5:59 AM CDT
☐	T1000CST	ARIZONA	3/6/09 10:00 AM CDT	3/6/09 10:00 AM CDT
☐	T1000CST	CENTRAL	3/6/09 10:00 AM CDT	3/6/09 10:00 AM CDT
☐	T1000CST	EASTERN	3/6/09 10:00 AM CDT	3/6/09 10:00 AM CDT
☐	T1000CST	PACIFIC	3/6/09 10:00 AM CDT	3/6/09 10:00 AM CDT
☐	T1000LOCAL	ARIZONA	3/6/09 11:00 AM CDT	3/6/09 11:00 AM CDT
☐	T1000LOCAL	CENTRAL	3/6/09 10:00 AM CDT	3/6/09 10:00 AM CDT
☐	T1000LOCAL	EASTERN	3/6/09 9:00 AM CDT	3/6/09 9:00 AM CDT
☐	T1000LOCAL	PACIFIC	3/6/09 12:00 PM CDT	3/6/09 12:00 PM CDT

Observed from Central Daylight Time during
   Standard time

Now you can see from the result of a forecast of two dates when a 10 o'clock job will run. In this example, you can see a forecast of March 6, 2009, when the United States is still on Standard time. The T1000CST job streams run at the same time, and the T1000LOCAL job streams run at different times.

Compare the results of forecast plans (Daylight time)

☐	Job Stream ▲	Workstation ^	Scheduled Time ^	Earliest Start ^
☐	FINAL	CENTRAL	3/9/09 5:59 AM CDT	3/9/09 5:59 AM CDT
☐	T1000CST	ARIZONA	3/8/09 10:00 AM CDT	3/8/09 10:00 AM CDT
☐	T1000CST	CENTRAL	3/8/09 10:00 AM CDT	3/8/09 10:00 AM CDT
☐	T1000CST	EASTERN	3/8/09 10:00 AM CDT	3/8/09 10:00 AM CDT
☐	T1000CST	PACIFIC	3/8/09 10:00 AM CDT	3/8/09 10:00 AM CDT
☐	T1000LOCAL	ARIZONA	3/8/09 12:00 PM CDT	3/8/09 12:00 PM CDT
☐	T1000LOCAL	CENTRAL	3/8/09 10:00 AM CDT	3/8/09 10:00 AM CDT
☐	T1000LOCAL	EASTERN	3/8/09 9:00 AM CDT	3/8/09 9:00 AM CDT
☐	T1000LOCAL	PACIFIC	3/8/09 12:00 PM CDT	3/8/09 12:00 PM CDT

Observed from Central Daylight Time

In this example, you have a forecast of March 8, 2009, after the United States switches to Daylight Savings Time. You can see that the T1000LOCAL job stream in Arizona is relatively one hour later because Arizona did not move the clock forward one hour for daylight savings.

Summary
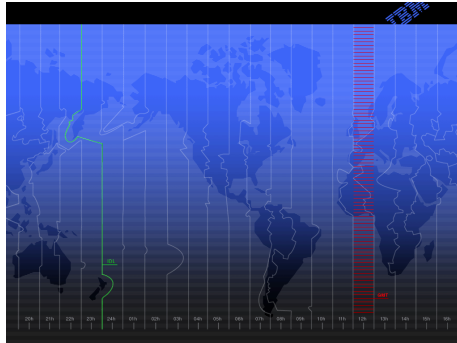
Tivoli Work Scheduler can:

- Manage work in time zones

- Set the global options

- Change the workstation definitions

- Use time zones for definitions of job streams

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In this presentation, you have seen how you can manage simple or complicated job times in different time zones using TWS time zone management. You learned how to set the global options to enable time zone management, change the workstation definitions to configure time zones, and set the definitions for your job streams to use those time zones.

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