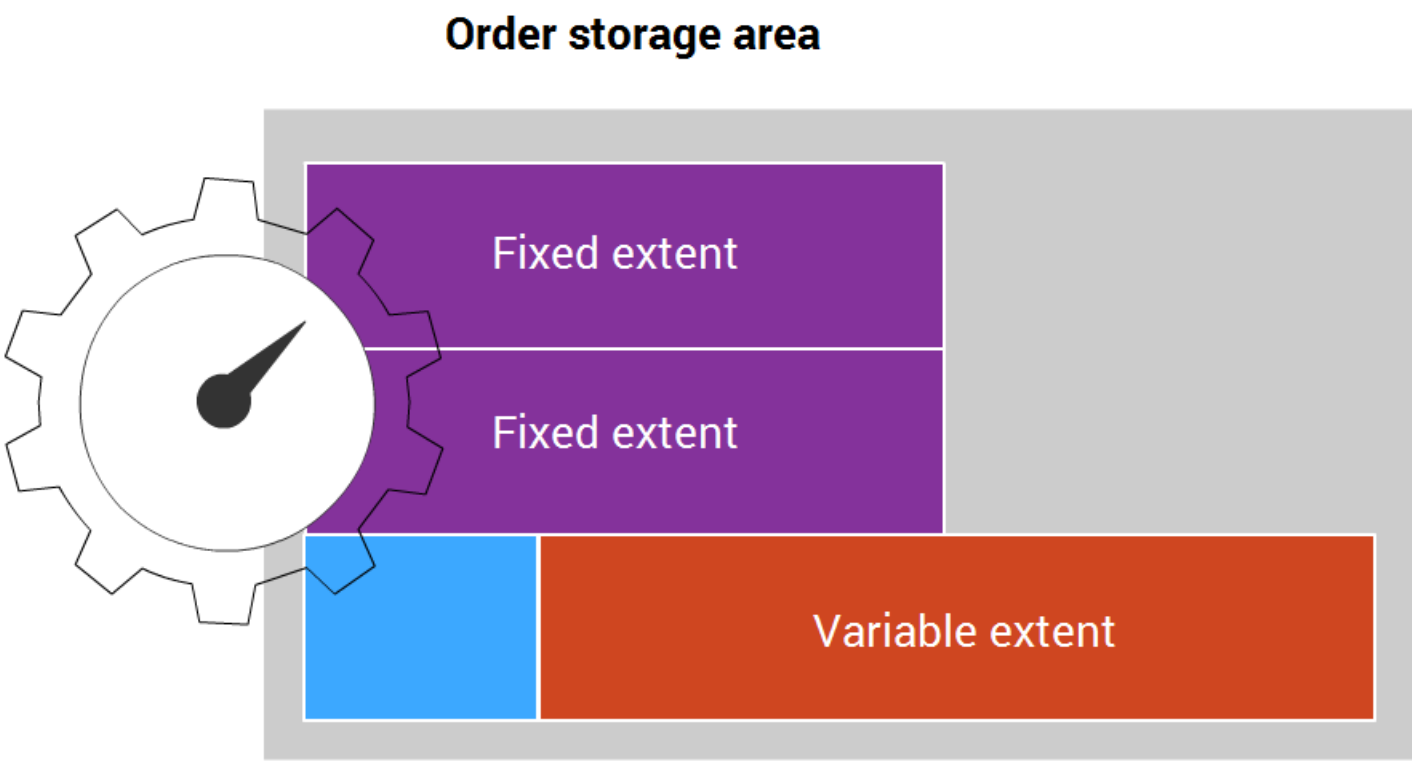
Progress®

Manage Extents of a Database

OpenEdge®

1

Monitoring extents



As your database runs and update operations occur, new data is continually added to the database. You should proactively monitor the space usage of extents and take steps to ensure that your database has enough space for new data.

As a general rule, if more than 80% of a storage area is used, then you should add more fixed extents to the area. Recall that the variable extent (the last extent) of a storage area should be used only as a safety net to catch overflow data in large update operations.

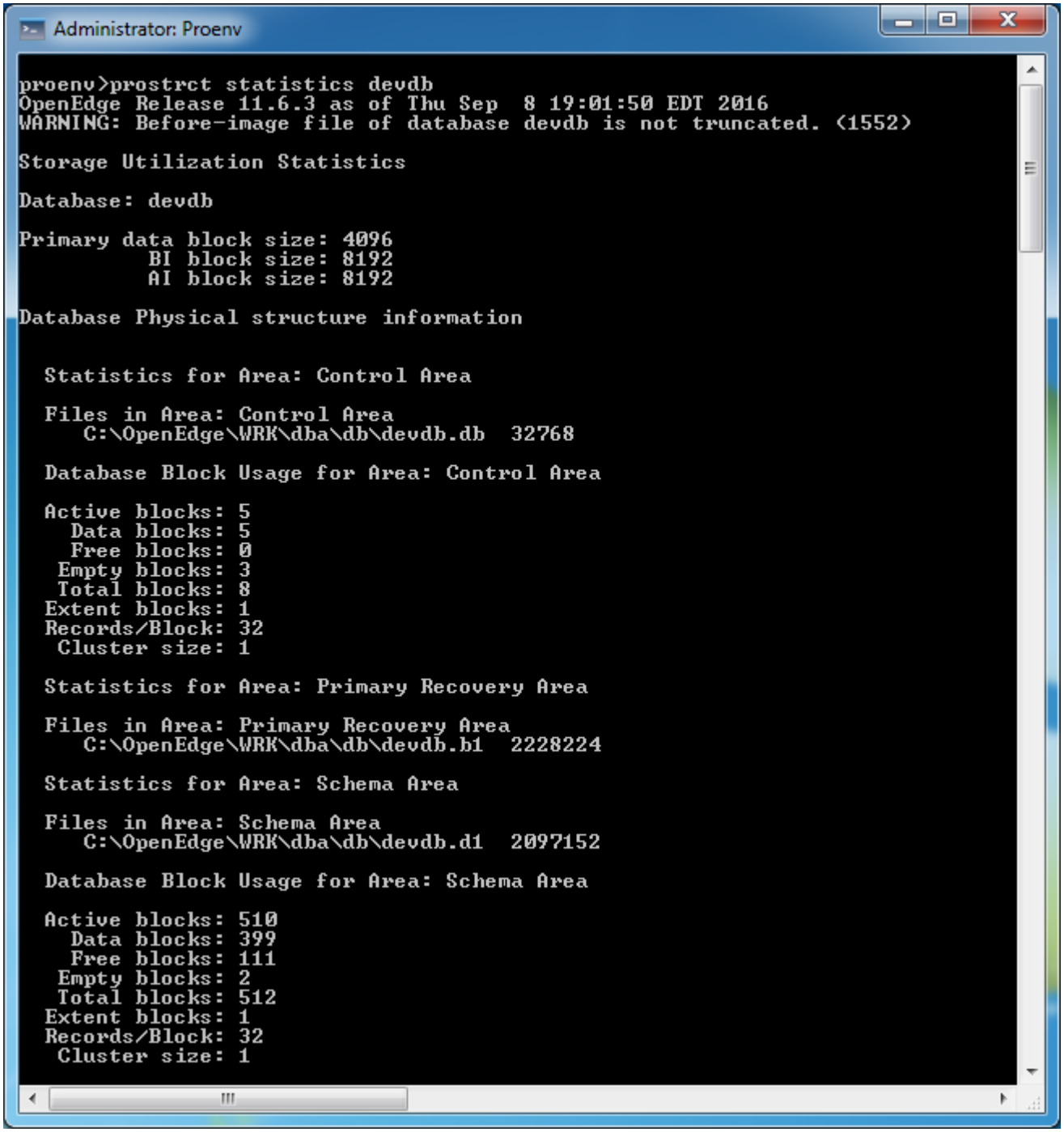
Progress® OpenEdge® RDBMS provides two tools to monitor extents, the PROSTRCT STATISTICS utility and OpenEdge Management.

You will learn how to monitor extents using each of these tools next.

For details, see the following topics:

- Monitoring extents using PROSTRCT STATISTICS
- Procedure: Monitoring extents using OpenEdge Management

Monitoring extents using PROSTRCT STATISTICS



You can use the PROSTRCT STATISTICS utility to monitor extents. The utility displays database block usage statistics about extents for each storage area, including:

- Number of data blocks used
- Number of total blocks used

The command to monitor extents using PROSTRCT STATISTICS is:

```
prostrct statistics db-name [> output-file.txt]
```

Using the statistics provided, you can then calculate the percentage of space used in each storage area using this formula:

Percentage used of a storage area = number of data blocks * 100 / number of total blocks

If the percentage of space used in a storage area is more than 80%, then you should add more extents to the area.

Here is an example of the PROSTRCT STATISTICS report on the **Order** area of the **sports** database. Notice the bold text highlighting the number of data blocks and the number of total blocks.

```
Database: sports
...
 Statistics for Area: Order
 Files in Area: Order
    C:\OpenEdge\WRK\dba\db\sports_11.d1 2097152
    C:\OpenEdge\WRK\dba\db\sports_11.d2 1376256
 Database Block Usage for Area: Order
 Active blocks: 839
 Data blocks: 838
 Free blocks: 1
 Empty blocks: 9
 Total blocks: 848
 Extent blocks: 2
 Records/Block: 32
 Cluster size: 8
...
```

You can then calculate the percentage of space used in the Order area with this formula:

838 * 100 / 848 = 99%

Because the percentage of space used in the Order area is more than 80%, you need to add more extents to the area.

Procedure: Monitoring extents using OpenEdge Management

If you have OpenEdge Management, you can use it to monitor the extents of a database. OpenEdge Management automatically calculates the percentage used in each storage area, and displays the information in both table and graph views.

Follow these steps to monitor extents using OpenEdge Management:

Step	Action
1	Launch OpenEdge Management. The **Authentication** page opens.

Steps	Action
2	Enter the username and password of the admin user and then click **Login**. The OpenEdge Management page opens.
3	Click **Resources > Go to Resources** and then click the name of the database for which you want to monitor extents. The **Database** page appears.
4	In the **Operational Views** of the running database, click **Storage Areas**. The Storage Areas page appears, displaying the different categories of areas such as system, application data, BI, and AI.
5	In the **Application data areas** section, look at the **Used** column. If the Used value of a storage area is greater than 80%, then you should add more extents to the area.

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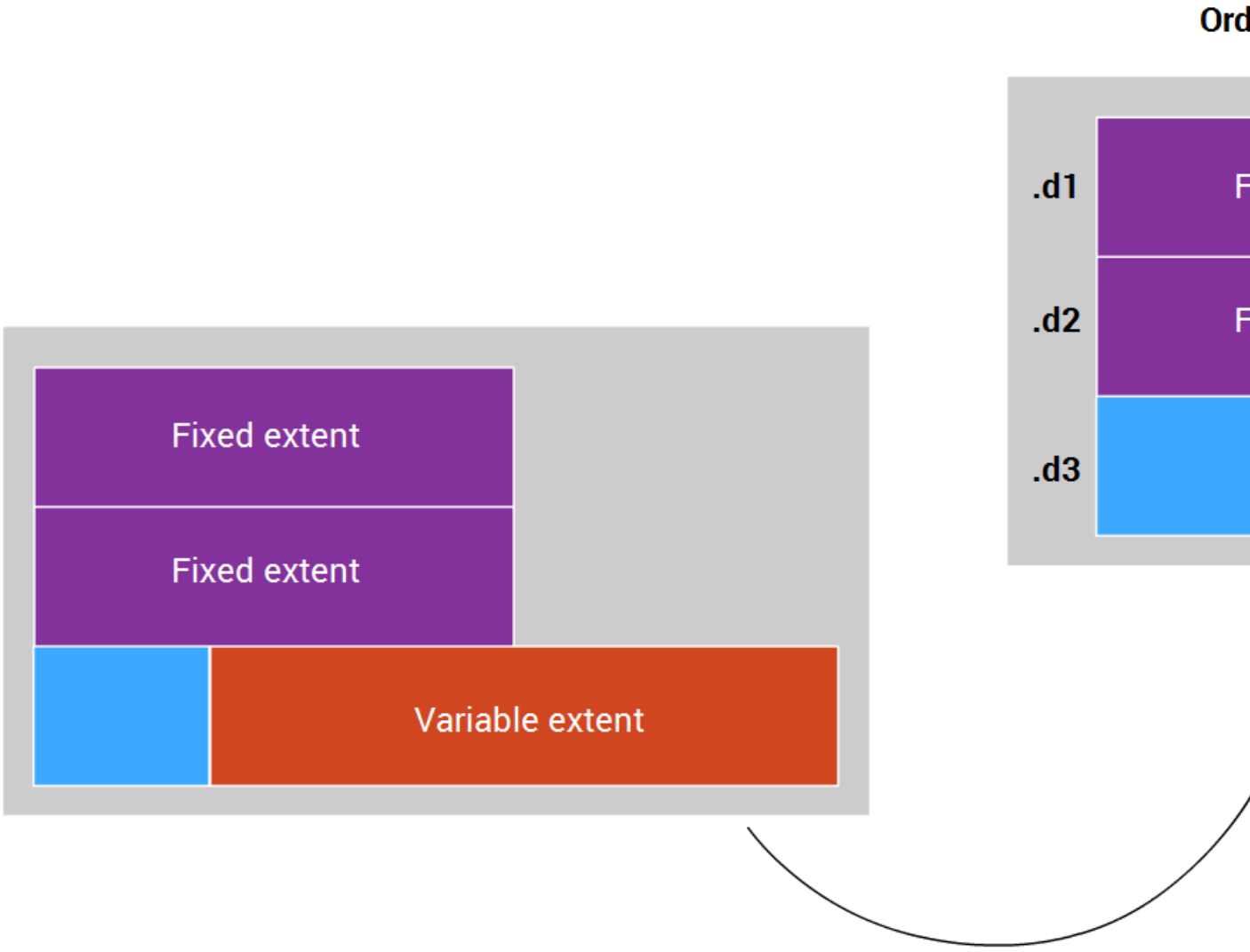
Adding extents



After monitoring the space usage of extents, you may have to add more extents to your database to support its growth.

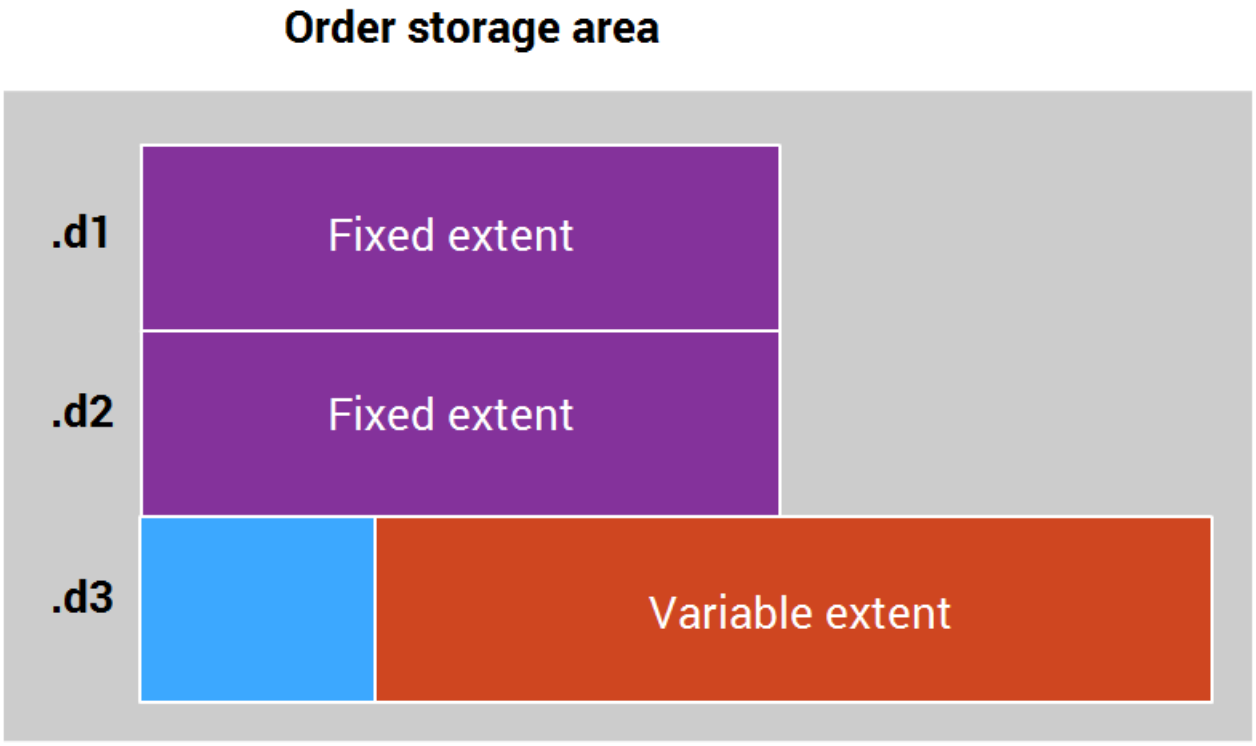
- You can add new extents to existing data storage areas or you can add new data storage areas to the database.
- If your database is enabled for after-imaging, you cannot add new data storage areas. However, you can add extents to existing data areas.
- If your business environment requires that your database be available all the time, then you must add extents online.
- If your business environment allows you to have regular downtime for routine maintenance, then you can add extents offline.

Note: IIf you want to modify extents such as to change the records per block, blocks per cluster, storage area names, or number and size of extents, you need to create a new .st file with the required extent attributes, create a new database using the .st file, and perform a dump and load.

For details, see the following topics:

- How OpenEdge RDBMS adds extents
- Adding extents online
- Adding extents offline

How OpenEdge RDBMS adds extents



When you add extents to a database, keep in mind the following:

OpenEdge RDBMS adds the extents to the end of a storage area. For example, if the Order area currently has three extents, .d1, .d2, and .d3, and you want to add three more, the new extents would be .d4, .d5, and .d6.

When you add extents, OpenEdge RDBMS caps off the last variable extent and turns it into a fixed extent. It then adds the new extents. For example, if your variable extent currently contains 10160K of data and your database has an 8K block size, then OpenEdge RDBMS would cap it off at 10240K (the multiple of 16 times 8 that is nearest to and greater than 10160K), and would not write any more data to it.

If you add extents offline, you should remove the variable extent, if it is empty, before you add new extents.

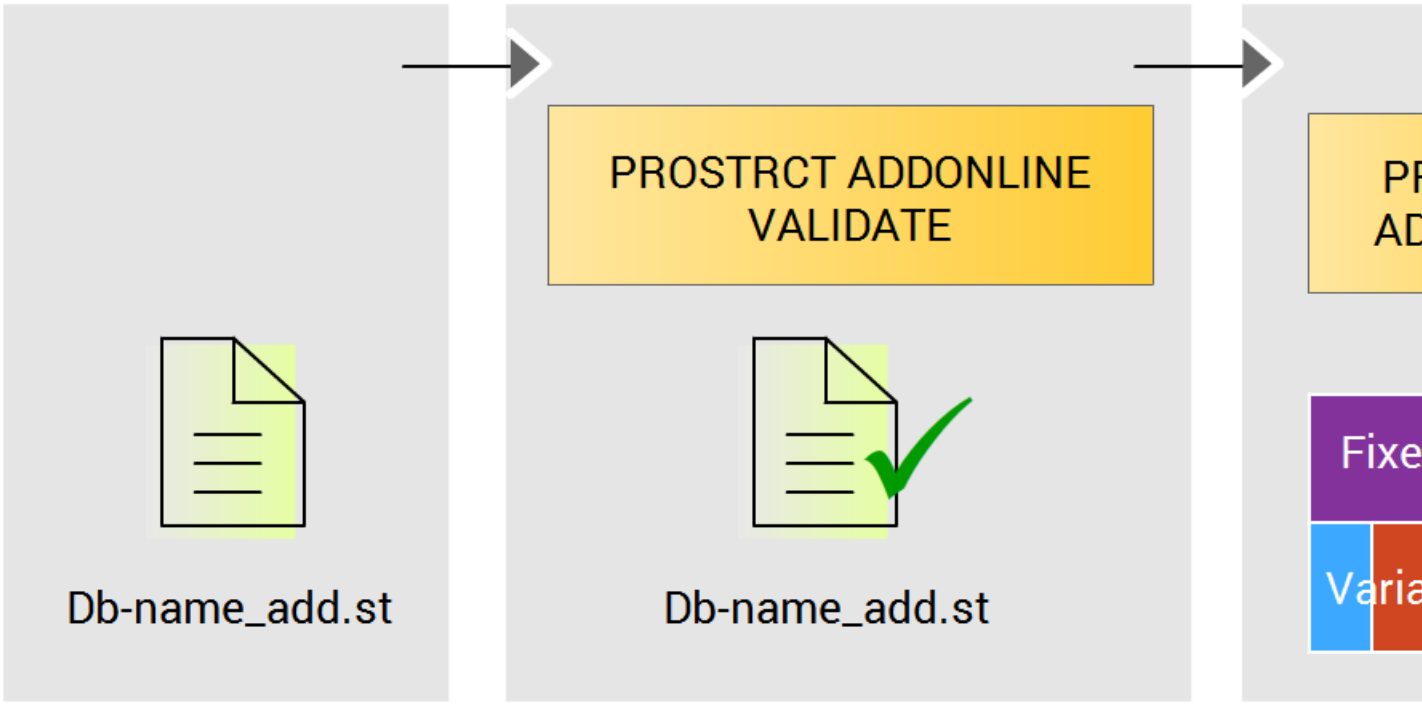
Adding extents online

If your business environment requires that your database be available 24x7, then you must add extents online. To add extents to a database online, you use the PROSTRCT ADDONLINE utility.

PROSTRCT ADDONLINE imposes the following restrictions:

- You cannot execute more than one PROSTRCT ADDONLINE instance at a time.
- Connected users must have read/write privileges to access newly created extents. If a currently connected user only has read privileges, you can begin PROSTRCT ADDONLINE, but that user must be disconnected before the utility can complete its work. PROSTRCT ADDONLINE prompts you if this is the case.

Steps to add extents online



To add extents to a database online, you perform the following tasks:

1. Create a .st file for the new extents.
2. Validate the extents using PROSTRCT ADDONLINE VALIDATE.
3. Add the extents to the database using PROSTRCT ADDONLINE and the .st file.
4. Update the .st file of the database using PROSTRCT LIST.

Step 1-Creating a .st file to add new extents

The .st file you create to add new extents only needs to contain one line for each extent you want to add.

The simplest way to create a .st file to add new extents is to open the existing .st file of the database, and then copy and paste the lines representing the storage area to which you want to add extents into a text editor. Next, modify the lines to define the new extents. Then, save the file as a .st file.

Follow these guidelines:

- Use the same records per block value as in the existing storage area or leave the value blank.
- Use the same blocks per cluster value as in the existing storage area.
- Specify the size and location of your choice for the new extents.
- Ensure that the last extent is a variable extent.
- Do not name the extents explicitly; let OpenEdge RDBMS do it for you.

Suppose the **Order** storage area of the **sports** database currently has two fixed extents and a variable extent as seen in the **sports.st** file below:

```
...
d "Order":11,64;64 . f 51200
d "Order":11,64;64 . f 51200
d "Order":11,64;64 .
...
```

Suppose you want to add two new fixed extents of **102400K** each and a variable extent to the **Order** area and store them in the data directory. This is what the .st file to add the new extents should look like:

```
# .st file for adding extents to the Order storage area
d "Order":11,64;64 ../data f 102400
d "Order":11,64;64 ../data f 102400
d "Order":11,64;64 ../data
```

Note that the new extents have the area name, area number, records per block, and blocks per cluster as the existing extents. But the location of the new extents is different, and the size of the new fixed extents is also different.

Step 2-Validating extents online

You should validate the .st file online before adding extents to your database. To do so, you use the PROSTRCT ADDONLINE VALIDATE utility.

The command to validate a .st file online is:

```
prostrct addonline db-name .st-file –validate
```

Assume you have a .st file, **sports_add.st**, that adds two fixed extents and a variable extent to the **sports** database. Also assume that the sports database is running.

To validate sports_add.st online, enter:

```
prostrct addonline sports sports_add.st –validate
```

Step 3-Adding extents online

After you validate the .st file online, you use the PROSTRCT ADDONLINE utility with the .st file to add the extents to a database.

The command to add extents online is:

```
prostrct addonline db-name .st-file
```

After you have validated the **sports_add.st** file, you can add the two fixed extents and a variable extent to the running sports database. To add the extents to the **sports** database online, enter:

```
prostrct addonline sports sports_add.st
```

Step 4-Updating the .st file of the database

The .st file of a database must reflect the current information in the database structure (.db) file to ensure continuity and consistency of database administration. So, every time you make changes to the structure of a database, such as adding, moving, or removing extents, you must update the .st file.

To do this, you use the PROSTRCT LIST utility. This utility uses the current information in the database structure (.db) file to show extent information in a database such as storage area names and types, records per block, blocks per cluster, as well as extent names, types, and sizes. It also generates a new .st file based on the database name and overwrites the existing .st file.

If you want to retain the existing .st file, rename the file before using PROSTRCT LIST. You can invoke PROSTRCT LIST online or offline.

The command to update the .st file of a database is:

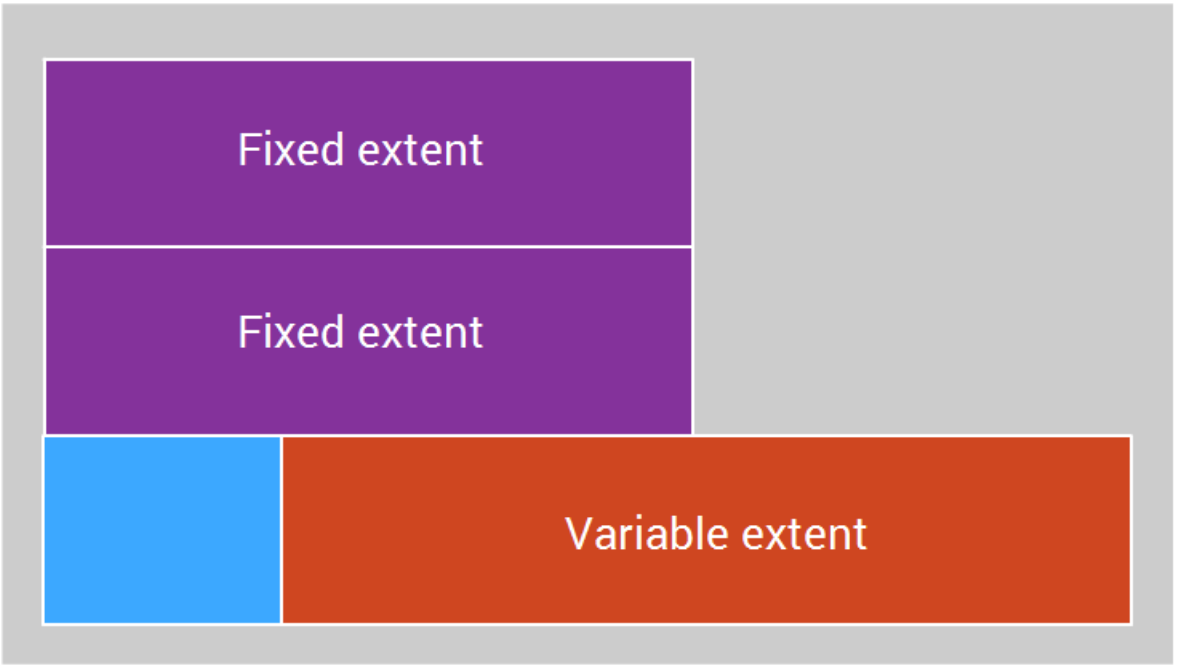
```
prostrct list db-name [.st-file]
```

After you have added extents to the **sports** database online, you can update the .st file of the database. Assuming that you want to overwrite the existing .st file, enter:

```
prostrct list sports
```

A new **sports.st** file is created.

Adding extents offline



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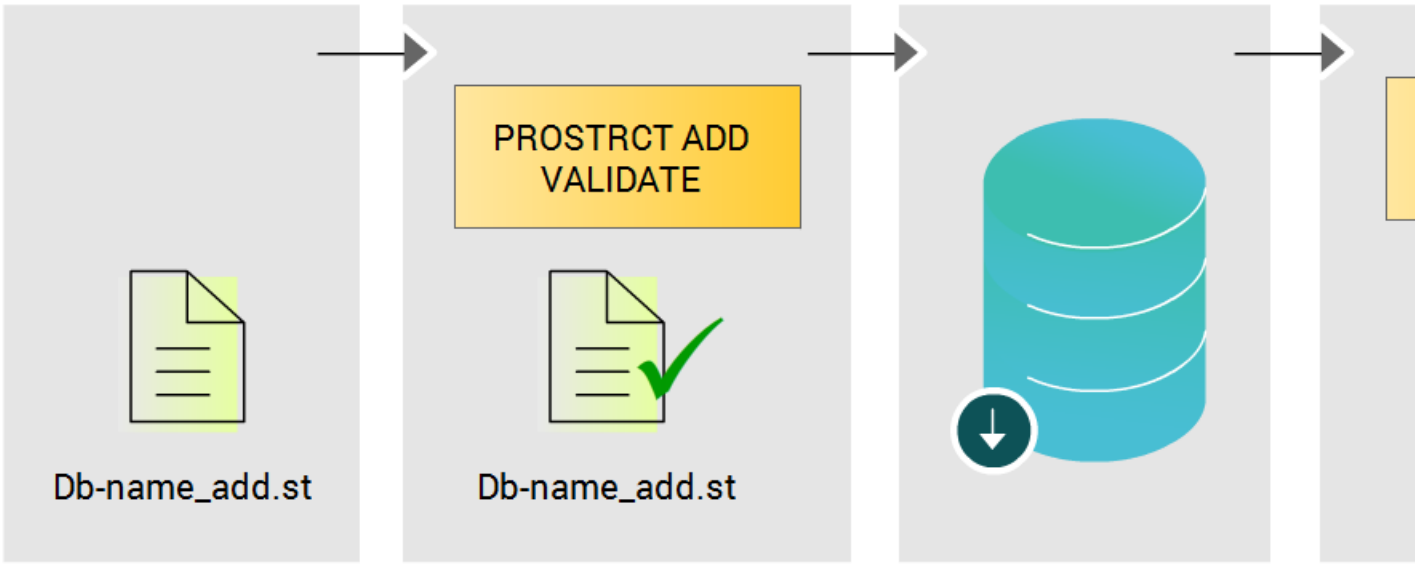
If your business environment allows regular downtime for performing routine database maintenance tasks, you can add extents offline.

As a best practice, if the variable extent of a storage area is empty, you should remove it. Then, you add new fixed extents and a variable extent.

If the variable extent already contains data, you cannot remove it. However, when you add fixed extents and a variable extent, OpenEdge RDBMS caps off the variable extent and turns it into a fixed extent. It then adds the new fixed extents and a variable extent to the area.

Steps to add extents offline



To add extents to a database offline, you perform the following tasks:

1. Create a .st file for the new extents.
2. Validate the extents using PROSTRCT ADD VALIDATE.
3. Shut down the database if it is online.
4. If you have time, back up the database.
5. Truncate the BI files of the database using PROUTIL TRUNCATE BI.
6. Remove the variable extent, if it is empty, using PROSTRCT REMOVE.
7. Add extents to the database using PROSTRCT ADD and the new .st file.

8. Update the .st file of the database using PROSTRCT LIST.
9. Restart the database.

Creating and validating a .st file

The task of creating a .st file to add extents offline is the same as that for adding extents online. However, to validate a .st file offline, you use the PROSTRCT ADD VALIDATE utility.

The command to validate a .st file offline is:

```
prostrct add db-name .st-file –validate
```

Assume that the **sports** database is offline. Also assume that you have a .st file, **sports_add.st**, that adds two fixed extents and a variable extent to the sports database.

To validate sports_add.st offline, enter:

```
prostrct add sports sports_add.st –validate
```

Truncating the BI files

After validating the .st file, if you have sufficient downtime, you should back up the database.

If the variable extent is empty, you must truncate the BI files of the database before you can remove the empty variable extent.

During the truncation process, OpenEdge RDBMS:

- Performs crash recovery.
- Uses the information in the BI files to update the database and the AI files.
- Verifies that modified data is successfully written to disk.
- Truncates the BI files to their original length.
- Sets the pointer to the beginning of the BI files.

The command to truncate the BI files of a database offline is:

```
proutil db-name -C truncate bi
```

After you have validated the sports_add.st file, you can truncate the BI files of the sports database offline. Enter:

```
proutil sports -C truncate bi
```

Removing the empty variable extent

After truncating the BI files, you can remove the empty variable extent. If you attempt to remove an extent that is not empty, OpenEdge RDBMS will prevent you from doing it.

You use the PROSTRCT REMOVE utility to remove an extent from a storage area offline.

The command to remove an extent offline is:

```
prostrct remove db-name extent-token area-name
```

Where:

`db-name`	The name of the database.
`extent-token`	The name of an extent's token. Use `d` for data extent.
`area-name`	The name of the storage area from which you want to remove an extent. If there are spaces in the area's name, enclose the name in double quotes.

Assume you want to remove the variable extent from the **Order** area of the sports database offline. Enter:

```
prostrct remove sports d order
```

Adding extents offline

After you remove the empty variable extent, you use the PROSTRCT ADD utility and the .st file for the new extents to add extents to your database offline.

The command to add extents offline is:

```
prostrct add db-name .st-file
```

After you add extents offline, you should update the .st file of the database using PROSTRCT LIST, and then restart the database.

After you have removed the variable extent from the **Order** area of the sports database, you can then add fixed extents and a variable extent to the area, using **sports_add.st**. Enter:

```
prostrct add sports sports_add.st
```

Then you should update the .st file of the **sports** database:

```
prostrct list sports
```

A new **sports.st** file is created.

Finally, you should restart the database.

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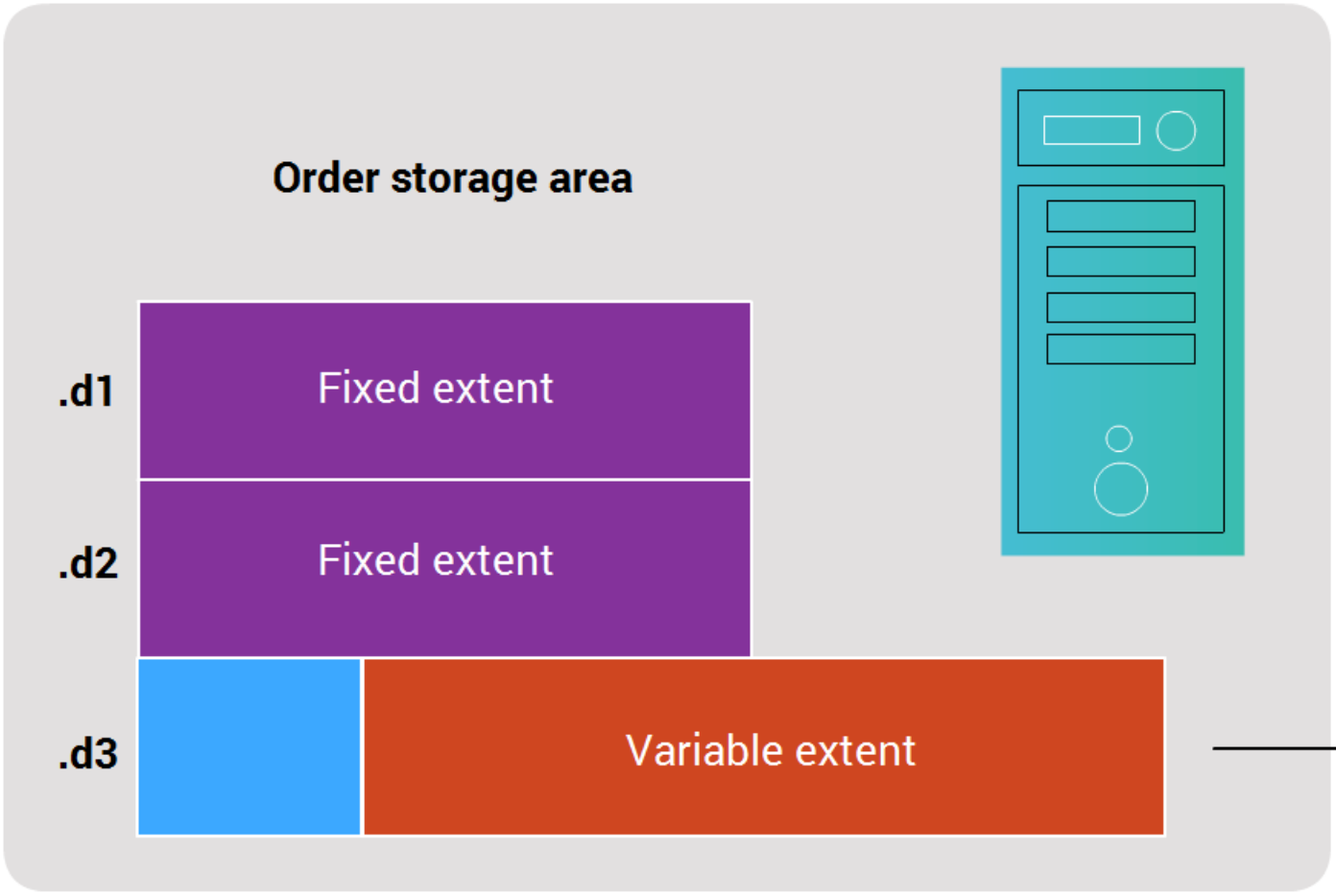
Moving extents



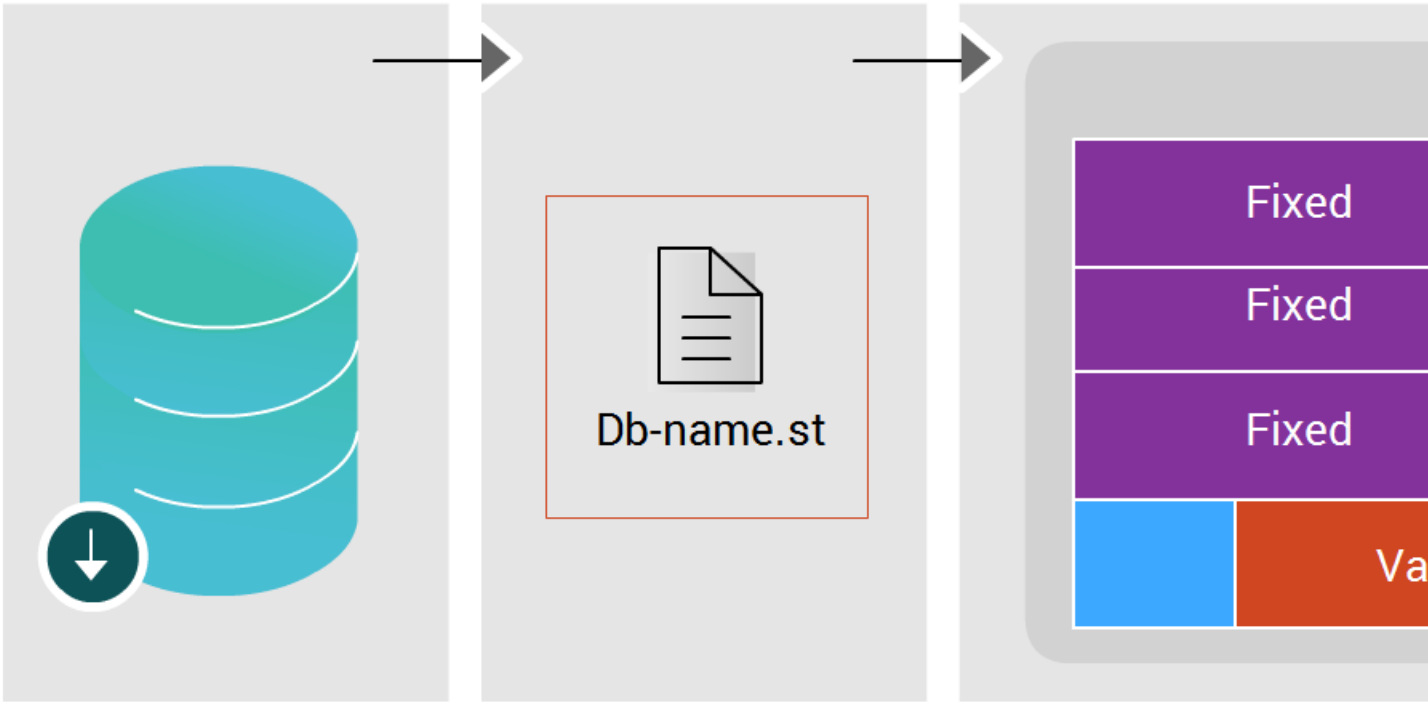
There are two common reasons for moving extents:

- As your database grows, you may find that your file system is running out of disk space and you need to move extents to a new location to allow for future growth. To monitor disk space usage, you can use your operating system's file management tools.
- If you find that you need to frequently add extents to a storage area, it indicates that there is a lot of update activity on the table(s) in the area. If this area resides on the same disk as other storage areas, you may want to move extents associated with the area to a separate, faster disk to improve performance.
- Before you can move extents, you must bring your database offline.

For details, see the following topics:

- Steps for moving extents

Steps for moving extents



Moving extents must be done offline. To move extents to another location, you perform the following tasks:

1. Shut down the database.
2. If you have time, back up the database.
3. Update the .st file with information about the new location.
4. Manually move the extents to a new location.
5. Update the .db file using PROSTRCT REPAIR.
6. Restart the database.

You already know how to perform most of these steps. Next, you will learn how to update the .st file and update the .db file.

Updating the .st file

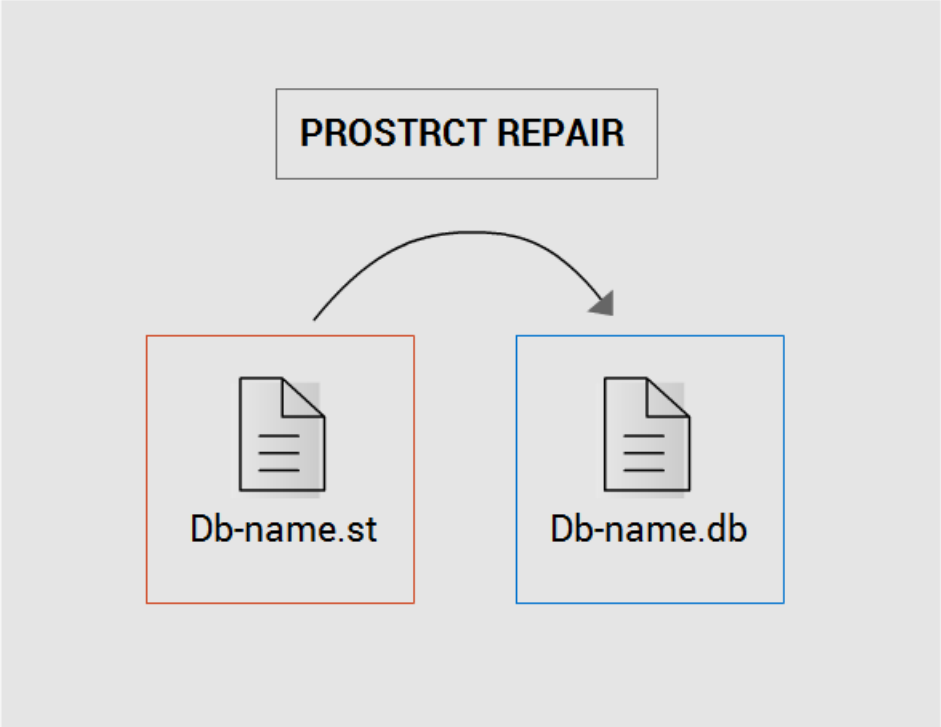
After you shut down a database and back it up, you must update the .st file of the database to reflect the new location of the extents you want to move.

The simplest way to do this is to generate a .st file of your database using PROSTRCT LIST and then edit the file to reflect the new locations of the extents you want to move. As a result of this step, you have the most up-to-date .st file.

Note: If you do not perform this step, then later when you update the .db file using the PROSTRCT REPAIR utility, the database uses the outdated .st file. This might result in the .db file being written with outdated extent directory information, and you might not be able to start up the database.

After you update the .st file of the database, you can move the extents to their new location.

Updating the .db file



After you move the extents to their new location, you can update the .db file of the database using the PROSTRCT REPAIR utility. PROSTRCT REPAIR updates an extent's directory information in the .db file with the information in the .st file.

The command to update the .db file of a database offline is:

prostrct repair db-name [.st-file]

If you omit the .st file, PROSTRCT REPAIR uses the db-name.st file to update the .db file.

Assume that the sports database is offline. Also assume that the sports.st file contains the most up-to-date extent information about the sports database.

To update the sports.db file offline, enter:

prostrct repair sports