

LESSON 1 BASIC CONCEPTS

This lesson outlines the basic information necessary for CHPS Simulation Focal Points to prepare RFC-administered simulation training.

By the end of this lesson, you should be able to:

- Describe CHPS simulations.
- Describe software capabilities.
- Describe available data options.
- Identify roles and responsibilities.
- Locate additional resources.

1.2 SIMULATIONS

Imagine you are in charge of training a new forecaster at a River Forecast Center. Would you feel comfortable allowing the new person to forecast in a real-time situation with live data?

Consider another scenario. You are an experienced forecaster who moved to a different RFC. Would you prefer learning the nuances of the rivers at your new duty location by reading documents, or by creating a mock forecast?

Simulations provide a safe environment in which forecasters can:

- Explore the system without causing harm to the operational system and data sets.
- Improve forecasting skills.
- Improve user knowledge of CHPS software functionality.

1.3 USING THE OC/SA

Recall there are two instances of CHPS, the Operator Client (OC) (live system), and the Stand Alone (SA).

The SA gathers data (either via manual data extraction or using an Archive Module) from the OC to create simulations.

- The OC serves as the **source** for data.
- The SA serves as the **platform** for performing the simulation based training.

Configure the CHPS SA to import archived files or canned observation data sets to recreate flood events, serve as a powerful hindcasting tool, or perform other simulated analysis.

The CHPS software, true to its "everything is configurable" nature, allows for several options for simulation-based training.

Keep in mind, the focal point will be working in **both** SYSTEMS.

1.4 DATA OPTIONS

This course covers three options for working with data. These options affect **saving** data from the OC and **retrieving** the data in the SA.

Note: Some options might not be available at all offices.

The options discussed include:

Options using archive files generated on the OC		Other data...
Archive Module	Archive Display Tool	Non-Archive Option
Automatically create an archive file on the OC at a user-defined time, then import and view the contents of the archive file on the SA.	Manually create (on the fly) archives on the OC and import the archives in the SA	Import canned data sets directly to the SA.
Files are stored as zip files on the local system in user-defined locations in both cases.		

1.5 SIMULATION FOCAL POINT

Since the responsibilities of the RFCs vary, CHPS Simulation Focal Points responsibilities also vary.

At a minimum, the CHPS simulation focal point fulfills the following duties:

- Maintain the configuration of archive workflows and archived output (zip files) on the OC.
- Maintain canned data sets and archived files (zip) used for simulation input data.
- Maintain a SA configured specifically for simulation training.
- Administer flood event simulation forecast training to the RFC forecast staff.
- Act as the in-house support for simulation training and configuration.

1.6 TIPS

Focal points should consider the following when using the **Stand Alone (SA)** version of CHPS to create simulation.

Division of Tasks - Configuration processes for CHPS simulations involve a set of configuration files.

Assigning one or more simulation focal point(s) with a specific list of tasks can prevent overwriting configuration files and limit system errors.

Recommendation: Select at least one simulation focal point to manage and maintain simulations.

Communication Skills - Maintain clear lines of communication. Examples include:

- adding comment lines when changing code
- developing a documentation strategy

Support Services - The Development and Operations Hydrologist (DOH) at your office is the first stop for guidance with CHPS.

In addition to local assistance, the Hydrologic Services Division (HSD) and Office of Hydrologic Development (OHD) are the primary entities for support and development services with CHPS.

1.7 RESOURCES

Here are some additional resources.

- [CHPS Basic Configuration Training](#)
- [CHPS NWS Homepage](#)
- [FogBugz](#)
- [Deltares Documentation](#)
- [CHPS Configuration Job Sheets](#)
- [oxygen Materials](#)
- [XML Materials](#)

LESSON 2 USING THE ARCHIVE MODULE

This lesson provides information on utilizing the CHPS Archive Module to automatically archive forecast data to use in simulation training.

By the end of this lesson, you should be able to:

- Describe configuration basics.
- Configure archive items.
- Describe data import.
- Describe the complete process of configuring the systems.

2.2 CONFIGURATIONS BASICS REVIEW

Recall from CHPS Basic Configuration Training, modules are the **activities** or **operations** performed in CHPS. Each module provides a specific functionality.

Modules request data from the datastore, **do something** to the data, and **write** data to the datastore.

The **five** modules emphasized in the basic configuration course included:

- Import Module
- Export Module
- Transformation Module
- Interpolation Module
- General Adapter Module

The **ModuleInstanceDescriptor.xml** file, located in the **RegionConfigFiles** directory, defines all of the **modules**.

You must configure **an instance of the module** and place it in the **ModuleConfigFiles** directory to use the module!

All functional tasks (including modules) in CHPS run through **workflows**. The activities nested within these workflows are the instances of the module to complete some basic operation.

This lesson introduces the **Archive Module**. The Archive Module sets up automatic creation of archive files. The Archive Module function and configuration is the same as other modules.

2.3 ARCHIVE MODULE INSTANCES

CHPS contains **four instances** of the Archive Module to create or restore archives. Apply these four archive functions to selected forecasts, threshold events, time series, and configurations.

This lesson only covers the **ForecastArchiver** instance of the Archive Module.

You must register the Archive Module, like all other CHPS modules, in order for it to be functional.

Note: Find more information on the functionality of the other versions of the module in the [Deltares Archive Module Documentation](#).

2.4 FORECAST ARCHIVER

The **Forecast Archiver** module instance creates an **archive zip file** at a frequency and in a location (folder) specified by the user. This archive zip file contains the results from the forecast run and all of the data used by this forecast.

Below is an illustrated example of the **Archive_Forecast.xml** file, an archive module. The following pages cover the functional details and the configuration process for altering or creating the multiple configuration files associated with the process.

Remember: The Archive Module and **CREATION** of archive files **runs on the OC** and the **RETRIEVAL** of created archive files **occurs on the SA**.

2.5 CONFIGURING THE OC

Configuring Archive Modules and Retrieving Files on the CHPS Operator Client

Archive Module Config is like any other module.

1. Create the module instance directory in the ModuleConfigFiles directory
2. Create the new workflow file in the WorkflowFiles directory
3. Register the module instance in the ModuleInstanceDescriptors.xml file in the RegionConfigFiles directory
4. Register the new workflow file in the WorkflowDescriptors.xml file in the RegionConfigFiles directory
5. Verify the module is listed in the ModuleDescriptors.xml file in the SystemConfigFiles directory
6. Verify the results in the Workflow Navigator

Optional step: Add the module to DisplayGroups

Additional Step

Configure the zip file directory in the oc_global.properties file in the xxrfc_oc directory using the tag: ARCHIVE_IMPORT_PATH and point to the zip file storage directory.

Details on the Steps

Step 1 - Create the module instance in ModuleConfigFiles directory

1. Click the link below this presentation to get a copy of the code
2. Copy and past the code into a new XML document
3. Name the document Archive_Forecast.xml
4. Save the file in the ModuleConfigFiles directory

Step 2 - Create the new workflow file in WorkflowFiles directory

1. Click the link below this presentation to get a copy of the code
2. Copy and past the code into a new XML document
3. Name the document Archive_Schedule.xml
4. Save the file in the system and preprocessing folder located in the WorkflowFiles directory

Steps 3 and 4

Register the module instance in ModuleInstanceDescriptors.xml in RegionConfigFiles directory

Register workflow in WorkflowDescriptors.xml in RegionConfigFiles directory

Steps 5 and 6

Verify module is listed in ModuleDescriptors.xml in SystemConfigFiles directory

Verify the results in the Workflow Navigator

Sample Code

Module Configuration [Archive_Forecast.xml](#) | [Register ModuleInstance](#) | [ModuleDescriptors](#)

Workflow Configuration: [Archive_Scheduled.xml](#)

2.6 CONFIGURING THE SA

Configuring Archive Modules and Retrieving Files on the CHPS SA

Same Procedure

The process of configuring an Archive Module is like any other module.

7. Create the module instance directory in the ModuleConfigFiles directory
8. Create the new workflow file in the WorkflowFiles directory
9. Register the module instance in the ModuleInstanceDescriptors.xml file in the RegionConfigFiles directory
10. Register the new workflow file in the WorkflowDescriptors.xml file in the RegionConfigFiles directory
11. Verify the module is listed in the ModuleDescriptors.xml file in the SystemConfigFiles directory
12. Verify the results in the Workflow Navigator

Optional step: Add the module to DisplayGroups

Additional Step

Configure the zip file directory in the sa_global.properties file in the xxrfc_sa directory using the tag: ARCHIVE_IMPORT_PATH and point to the zip file storage directory.

Details on the Steps

Step 1 - Create the module instance in ModuleConfigFiles directory

5. Click the link below this presentation to get a copy of the code
6. Copy and past the code into a new XML document
7. Name the document Import_Archive_Forecast.xml
8. Save the file in the ModuleConfigFiles directory

Step 2 - Create the new workflow file in WorkflowFiles directory

5. Click the link below this presentation to get a copy of the code
6. Copy and past the code into a new XML document
7. Name the document Import_Archive.xml
8. Save the file in the system and preprocessing folder located in the WorkflowFiles directory

Steps 3 and 4

Register the module instance in ModuleInstanceDescriptors.xml in RegionConfigFiles directory
Register workflow in WorkflowDescriptors.xml in RegionConfigFiles directory

Steps 5 and 6

Verify module is listed in ModuleDescriptors.xml in SystemConfigFiles directory
Verify the results in the Workflow Navigator

Sample Code

Module Configuration [Archive_Forecast.xml](#) | [Register ModuleInstance](#) | [ModuleDescriptors](#)

Workflow Configuration: [Archive_Scheduled.xml](#)

2.7 DATA IMPORT

Import data into CHPS once the SA is properly configured.

Preparation

Before importing data into the CHPS SA, ensure the following:

- The SA runs without errors.
- The latest system configuration (i.e. **/Config** and root configuration files) are installed.
- The archive data is available for the exercise and the paths to the archive files are correct.

Import Archive Files

Complete the following steps to import the archive files to the SA.

1. Copy the archive files to be imported into the SA import archive directory.
2. Start the SA.
3. Set the **current system time** to match the archive file time (the start of the event).
4. Open the **Manual Forecast Display**.
5. Select and run the **Import_Archive Workflow**.

No additional settings need defining. Wait until the workflow completes.

Viewing Results

Complete the following steps to view the results of the required forecast.

1. Open the **Forecast Management Display** to view the forecasts in the local datastore.
2. Select a **forecast** to view and click the **Open** button. The forecast should appear in the bottom left corner of the screen.
3. Double click the **forecast** to set the system time to the **TO** of the archive forecast run.
4. View results by navigating through the relevant forecast groups and associated segments.

LESSON 3 USING THE ARCHIVE DISPLAY

Realistic scenarios for simulation training make more of an impact on the forecast staff. Use the information in this lesson to set up the Archive Display to import archive forecast data to use in simulation training.

By the end of this lesson, you should be able to:

- List the steps to create archive files using the Archive Display tool.
- Describe the process of retrieving archive files using the Archive Display tool.
- Describe the data import process.

3.2 ARCHIVE DISPLAY

The Archive Display tool, an add-on user interface, creates or imports forecast run archive files manually.

Attention! The Archive Display **only** functions when the Zip Archive has been configured/installed on your RFC's CHPS.

Use the Archive Display to:

1. Create archived forecast runs manually on the OC.
2. Import archived forecast runs from the database into the SA.
3. Run queries on the database to locate archive files on both the OC and SA.
4. Import archived zip files saved on the file system into archive database.
5. Retrieve archives from the database to the file system as a zip file.

Files created from the Archive workflow are stored as zip files on the local file system. The zip files are ingested into an archive database and stored as metadata. The archiving display tool links to this database and can perform any of the functionality described above.

Access the Archive Display Tool

Use the following steps to access this GUI.

1. Open the OC where the forecast ran.
2. Click the **Tools** button in the Explorer Menu.
3. Select **Archiving** from the drop down menu.
4. The Archive Display GUI opens on the screen.

3.3 CAVEATS

As noted in 3.2, the Archive Display works **only** when the Zip Archive has been configured and installed.

Offices have discovered issues when using the Zip Archive.

Consider these issues before determining whether the Archive Display is suitable for your office's needs.

Caveats

Rolling Barrel must be **off** when using the Zip Archive

Recreating an event exactly is not possible because:

- Modifiers are not saved
- The configuration files used at the time of the archive must also be used; otherwise, the ratings might be wrong

3.4 RUNNING A QUERY

Use the Archive Display tool to find a forecast or narrow results based on a particular search parameter to locate a specific event for the training.

Note: This feature is available in both the OC and the SA.

These parameters include:

1. Region ID (location)
2. Start date
3. End date
4. Minimum number of forecasted threshold crossings
5. Minimum number of observed threshold crossings
6. What-if scenario

Run a Query

Use the following steps to perform a query either from an offline OC or from the SA.

- Access the Archive Display tool (instructions in the previous section of this lesson).
- Click Upload to Archive.
- Select Forecast Runs under the Retrieve from Archive folder located on the top left panel of the window.
- Select an event or type search parameters.
- Click the Run Query button on the top right corner of the GUI.
- Click Upload.

Queried results load in the center of the GUI.

3.5 MANUAL ARCHIVING ON THE OC

The Archive Display tool manually creates forecast run archives. Use manual archiving for **unapproved** forecasts. For example, forecasts run with what-if scenarios or test forecasts.

Note: The automatic archiving function of the Archive Module creates **approved** forecast archives.

Manually Archive

Use the following steps to use the Archive Display to archive a forecast run manually.

1. Access the Archive Display tool on the **OC** where the forecast was run (same local datastore).
2. Select the **Forecast Runs** option under **Upload to Archive** (subfolder) located on the top left of the window.
3. Select the **forecast to archive** from the list of forecasts in the middle window.
4. Click the **Upload** button.

At this point, the forecast is written to a zip file and stored in the configured archive folder until it is picked up by the archive process and stored in the archive database.

Hint: Archive **several** forecasts to **one** archive file by checking the **Export Single File** box in the top right corner of the archive window.

Reference: *Manual Archiving procedure from the [Deltares wiki](#).*

3.6 RETRIEVE ARCHIVES FROM THE DATABASE

The previous page outlined how to create a forecast archive manually.

The file produced by this forecast run is written to the file system and picked up by the archive process where it is stored in the archive database as metadata.

The zip file on the file system is erased.

The Archive Display tool provides access to archives stored in the archive database as metadata. The tool also retrieves the metadata as zip files to the file system.

Retrieve Files

Use the following steps to retrieve an archive file from the archive database manually (using the Archive Display tool):

1. Access the Archive Display tool on the **SA** with the latest RFC configuration.
2. **Query** the archive database (described in Running a Query) to find the required forecast run archive.
3. Click the **Save** button in the bottom right of the window.

The requested file is saved to the local file system as a zip file.

3.7 Import Archives from the File System

The Archive Display tool manually imports archive files from the file system into the archive database.

Benefit: This functionality is useful when obtaining archive zip files not already saved as metadata in the archive database.

Import Archives from Files

Use the following steps to import an archive zip file from the file system into the archive database manually:

1. Access the Archive Display tool on the **SA** with the latest RFC configuration.
2. Select **Forecast Runs** under the Upload to Archive (subfolder) located on the top left of the window.
3. Click the **Import file button** on the bottom right of the window. A new window will open, showing all the files available in the archive import directory on the file system.
4. Select the **file** to import.
5. Click the **Open** button.

The system imports the requested file into the archive database for direct import into the SA.

The next section describes how to import the data into the SA.

3.8 Data Import into the SA

Use the Archive Display tool to import the archives from the archive database directly into the SA to view the contents of the archive files.

The data available in the archives can serve as the basis for flood event simulations.

Note: Archives can **only** be directly imported into the SA.

Preparation

Before beginning the import of data into the SA, ensure:

1. The SA runs without errors.
2. CHPS has the latest system configuration (i.e. **/Config** and root configuration files).
3. The requested archive files have been imported into the archive database (previous section).

Manually Import Archives

Complete the following steps in order to *retrieve* an archive file from the archive database manually:

1. Access the Archive Display tool on the **SA** with the latest RFC configuration.
2. Select the **Forecast Runs** option under the **Upload to Archive**(subfolder) located on the top left of the window.
3. Select **one or more forecast runs to download** by highlighting the selection. **Note:** *Query the archive database (described in Running a Query) to find the required forecast run archive(s) as needed.*
4. Click the **Download** button on the bottom right of the window.

The selected archive(s) download from the database and are imported into the SA.

View the Results

1. Access the Archive Display tool on the **SA** with the latest RFC configuration.
2. Open the **Forecast Management Display** to view the forecasts, listed under forecasts in the local datastore.
3. Select a forecast to view.
4. Click the **Open** button. It should appear in the bottom left corner of the screen.

5. Double click this to set the system time to the **T0** of the archive forecast run.
6. View results by navigating through the relevant forecast groups and associated segments.

LESSON 4 USING NON-ARCHIVE DATA

Want a way to create canned data sets without having to set up the Archive Module or Archive Display tool? This lesson shows you how to use canned data sets to recreate flood events.

By the end of this lesson, you should be able to:

- Identify event folder structure.
- Save and retrieve data.
- Import canned data.

4.2 NON-ARCHIVE BASED SIMULATION

The non-archive method is another way to gather necessary model initialization material (**canned** observed data sets) to run event simulations utilizing the SA.

Difference - This method differs from the archive method because it gathers and saves all of the model initialization data.

Benefits - This method does not require in-depth configuration (like the **Archive Module**) of CHPS in order to use this method in the SA. Lesson 3 noted some drawbacks to using the **Archive Display** tool. The Zip Archive portion of the tool was unable to save all of the data necessary to reproduce an event exactly.

Information to Archive - Some office saves the local datastore. The advantage is the warm states can be used as cold states for the simulation. Drawbacks are redundancy in the files, so only do this for a big event to prevent storage issues. Also, modifiers are not included.

The Process

1. The following events occur when a simulation runs using the Non-Archive Method.
2. The simulation focal point saves model initialization data (observed data) using the OC via the export module (or other technique) as canned data sets.
3. The data sets are stored in an event folder broken down into event stages (e.g. Preparation, EventDay1, EventDay2, etc.).
4. Feed the canned data sets into the SA in a sequence of steps to mimic a real event.

4.3 EVENT FOLDER STRUCTURE

The non-archive method runs in a sequence of stages with data added in steps to mimic the data ingest during a real event.

Note: This method cannot replicate events. The warm states created for this method include observational data, but not antecedent conditions.

Streamlining the Process

Create a preparation folder to hold the observational data two weeks to a month prior to the event (information used for model spin up and creation of warm states).

Separate saved data into specific times (typically 24 hours) through the length of the event selected.

Create a data folder for each period. Break down observational data into subdirectories based on data type (ofsde, grib1, etc.).

Note: The figure on the right shows an example of how to separate event data.

Hint: Tar or zip the canned data sets to save disk space on the local file system.

4.4 SAVING DATA SETS

Hint: Develop a plan at your office with the CHPS System Manager, Configuration Focal Point, and ITO on how to gather and save observational data sets.

Your team can discuss what data you are using for CHPS model initialization and how the data is being imported into CHPS. Then, develop techniques to save and store the data.

Techniques for saving observational datasets include:

1. Configuring the CHPS Export Module to generate an output (containing data) for the event period.
2. Saving copies of data fed into CHPS OC import module.
3. Saving the local datastore.

Support

Contact the [Hydrologic Services Division \(HSD\)](#) and/or [Office of Hydrologic Development \(OHD\)](#), the primary entities for support and development services with CHPS.

4.5 RETRIEVING DATA SETS

Retrieving data sets involves only two steps. The focal point should do the following when facilitating simulation training:

1. Locate and copy the event data folder into the main CHPS application folder where you are going to run your simulation.
2. Unzip the file if the data is tarred/ziped.

Generally, the CHPS application folder is located in the following directory:

```
/awips/chps_share/sa/YOUR_CHPS_APPLICATION_FOLDER/
```

It usually contains three folders:

- `/bin`,
- `/jre`,
- and a regional CHPS application directory named `/xxrfc_sa`.

3. To begin importing data into the SA, copy the data in each stage (Preparation, EventDay1, EventDay2, etc.) into the CHPS import directory as needed.

Hint: A script can save time when copying the contents of each stage into the CHPS import directory. Ask other RFCs if they have an existing script you can modify.

4.6 IMPORTING CANNED DATA SETS

Preparation

Before beginning the import of data into the CHPS SA, **ensure** the following:

1. The SA runs without errors.
2. You have the latest system configuration (i.e. **/Config** and root configuration files).
3. You have the canned data for the exercise and the correct paths to those data sets.
4. **Recommendation:** Delete the contents of the local datastore prior to starting the data import (i.e., start from an empty database).

Data Import General Procedure

Use the following steps to import data. **Note:** Click the links to see images of the actions described below. Images open in a new window.

Creating the Warm States

1. Select and copy observational data from the preparation directory into CHPS SA import directory.
2. Start the CHPS SA.
3. Adjust the system time to starting date of the event.
4. Open manual forecast display.
5. Run the Import workflow and verify its completion in the [log panel](#).
6. Run the Preprocess (RRS) workflow as a cold state making sure to set the correct cold state time to the start of the observational data and verify its completion in the [log](#).
7. Run the forecast group UpdateStates workflows as a cold state using the same time period as the Preprocess (RRS) workflow and verify its completion in the [log panel](#).

Warm states have now been generated for the model. Now add the data for the “current” day on which the forecasting will begin.

Reminder: Since the antecedent conditions are not included, the warm states will not produce identical results as the event being simulated.

Event Day One

1. Select and copy observational data into CHPS SA import directory for day one of the event.

2. Adjust the system time to day one of event.
3. Open manual forecast display.
4. Run the Import Workflow and verify its completion in the [log panel](#).
5. Run the Preprocess (RRS) workflow and verify its completion in the [log panel](#).

You are now ready to begin the event simulation. Now go to the IFD in forecasting mode.

1. Use the run options panel to select the newly created warm states.
2. Select a forecast group, and begin systematically making forecasts for each segment within the forecast group.
3. Run the [UpdateStates workflow](#) (e.g. ForecastGroup_UpdateStates) for the selected forecast groups.

Follow the same procedure used for Event Day One to move to the next forecast period, but add the observational data for the next stage, Event Day Two.

Complete this general process through the end of the event, remembering to update states after approving each day's forecast.

[Click here for instructions on importing the data using the non-archive method.](#)

COURSE SUMMARY

Simulation Basic Concepts

CHPS focal points can gather data and develop simulations to provide a safe learning environment in which forecasters can:

- Explore the system without causing any harm to the system or operational datasets
- Improve forecasting skills
- Improve user knowledge of CHPS software functionality

The **OC** serves as the source for simulation data and forecasters perform simulation-based training on the **SA**.

Focal points have 3 options for creating and importing data into CHPS to run simulations: **Archive Module**, **Archive Display**, and **Non-Archive Method**.

Note: All of the options utilize CHPS, but some may not be available at your RFC.

Focal point roles vary by office, but at a minimum should...

- Maintain the configuration of archive workflows and archived output (zip files) on the OC.
- Maintain canned data sets and archived files used for simulation input data.
- Maintain a SA configured specifically for simulation training.
- Administer flood event simulation forecast training to the RFC forecast staff.
- Act as the in-house support lead for simulation training and configuration.

Using the Archive Module

Remember, a module is an activity or operations done in CHPS. One of the modules, the Archive Module, performs archiving activities. The Archive Module uses the **OC** to create an archive file automatically at a user-defined time and the **SA** to import and view the contents of the archive file.

Configure the Archive Module the same as any other module.

Run the simulation using the following procedure:

1. Copy the archive files into the SA import archive directory.
2. Start the SA.
3. View the results of the imported archive file using the Forecast Management Display.
4. Select a forecast and navigate through the appropriate forecast groups.

Using the Archive Display

The Archive Server needed to create the zip files used in the Archive Display is not currently functional. Archive files (stored as zip files on the local file system) are ingested into an archive database, and stored as metadata. The Archive Display tool can only be used when configured as your RFC's CHPS.

Using Non-Archive Data

The non-archive method saves observational data from the CHPS OC as data sets in an event folder. The data is imported into the CHPS SA in stages to mimic a flood event. A script can save time when copying the contents of each stage into the CHPS import directory. Ask other RFCs if you have a script you can modify.

Congratulations. You reached the end of the course material!