LESSON 1 GRAPHICS GENERATOR OVERVIEW

Graphics Generator, an interactive function within CHPS, makes it easier to create forecast products. The customized formats of these products helps partners and customers make informed decisions.

This lesson describes Graphics Generator - the software, its purpose, and some terms you need to know.

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

- Define Graphics Generator.
- Define Graphics Generator terms.
- Describe the connection of Graphics Generator to AHPS and ESPADP.

1.2 INTRODUCTION TO GRAPHICS GENERATOR

Graphics Generator, a tool within the CHPS interface, replaces the **product-generating** capability of the Ensemble Streamflow Prediction System Analysis and Display Program (ESPADP).

Graphics Generator offers several advantages. You can...

- Interactively build chart-based products
- Create output using automated workflow
- View all active segment products at a glance

Clarification: You might hear people refer to Graphics Generator as "GraphGen".

Graphics Generator refers to the application; GraphGen is a term used for the viewer and editor panels in the application.

Team Effort

Graphics Generator is a **nationally supported** application developed by the Office of Hydrologic Development (OHD).

The application was released in the OHD-CORE-CHPS 3.1.a release in March, 2013.

This eliminates the need for office-specific applications to generate AHPS output.

Software and configuration help is available through FogBugz.

1.3 SPECIFICATIONS

Graphics Generator has six components; the GraphGen Model Adapter, the Graphics Generator Engine, and four Graphics Generator interfaces.

Thea GraphGen Model adapter allows a CHPS workflow to generate a product. The Graphics Generator Engine drives the four Graphics Generator interfaces.

Only CHPS Stand Alone instances configured for Graphics Generator have these components. Contact the XML Configuration Focal Point if some or all of these components are missing.

Here is a brief look at the Graphics Generator interfaces:

GraphGen Tree panel – manage templates

GraphGen Editor panel – build and edit templates

GraphGen Viewer panel – view products (appears as a minimized panel on the graphic)

GraphGen Thumbnails panel – view all available products for the active segment and manage the segment's settings

Lesson 3 will explore each of these interfaces in detail.

Forecasters do not use Graphics Generator. Automated workflows create output to AHPS.

Reference: Graphics Generator Getting Started Guide, Section 3

1.4 GRAPHICS GENERATOR TERMINOLOGY

Graphics Generator uses templates to create output. Templates are definitions of what the output should contain and how it should look.

The application uses two types of templates:
- **product**
- **reference**

Product Templates

Product templates are instructions telling Graphics Generator how to generate a product. These instructions tell Graphics Generator how to build the chart and create output based on the chart data.

Reference Templates

Product templates refer to **reference templates** to generate charts (output). More than one template can be referenced to build the chart.

The output of Graphics Generator viewed through a component or output to a file.

Reference templates can refer to other r1.4eference templates **only** if the output cannot be achieved any other way.

Reference templates are similar to product templates but do **not** include instructions for generating output.

Note: When you see "products" mentioned on the interface, it refers to product templates. Likewise, "templates" refers to reference templates.

Product and Reference Template Connection

Product and reference templates are similar and work together to produce output. Consider the following example:

You want to create an image file of:

- observed streamflow as green circles
- forecast streamflow as a blue line

- exceedence probabilities lines in shades of red
- shading between the maximum and minimum flows

You would use the following steps to accomplish this task.

1. Create templates for displaying each of the parameters.
2. Create a product referencing the three templates and defining the type of output. In this case, an image file.

Before moving on, take a few minutes to read about the connection among AHPS, ESPADP, and Graphics Generator.

Advanced Hydrologic Prediction Service (AHPS)

AHPS is a web-based hydrologic forecast product suite.

The products depict probabilistic forecasts up to months in advance.

Our partners and customers use these products as decision support tools.

ESPADP - ESPADP is the legacy system for creating output to AHPS. The acronym ESPADP appears on workflows used to produce the ensembles used in Graphics Generator.

Graphics Generator

Recall from earlier in this lesson, Graphics Generator is the new application, contained within CHPS, for creating output to AHPS.

The way ESPADP and Graphics Generator work is different; the **calculations** of Graphics Generator and ESPADP are the same.

Graphics Generator vs. ESPADP

	Graphics Generator	ESPADP
Input file format	Pi-timeseries XML	Binary and datacard
Interface components	CHPS IFD plug-ins	Separate AWIPS application
Interface location	CHPS IFD	AWIPS
Execution	CHPS workflows	Command line
Forecaster actions	None	Compute and view output
Model adapters	Create forecast output	Generate input files

As the Graphics Generator Product Configuration Focal Point, you have an important role. You are responsible for maintaining AHPS product consistency and creating new types of graphics for your office.

This lesson describes skills a Graphics Generator Product Configuration Focal Point needs to build and edit templates.

By the end of this lesson, you should be able to:
- List Product Configuration Focal Point tasks.
- Describe any special skills needed by the focal point.

2.2 TASKS

The previous lesson outlined the advantages of Graphics Generator, including how product generation is typically transparent for forecasters.

Your role as the focal point is to make the product generation as easy for them as possible.

Create and Customize Templates

The most important task is establishing and maintaining the templates used to generate products.

Edit the template delivered in OHD-CORE-CHPS 3.1.a to match the current AHPS ESPADP graphics required for your RFC.

Create specialized images for use at your office or by partners and customers.

Goal: Create an AHPS reservoir product

1.   Action Plan: Use the template from an AHPS streamflow product as a starting point or begin with a blank template.
2.   Modify the product as needed.

Update and Maintain

Templates for standardized products rarely change. Your office may have local products requiring more frequent changes.

Clean up templates no longer used to create output or ones created while learning about Graphics Generator.

Create Backups

Make sure your work building templates and products do not go to waste. Lesson 4.5 covers the details of this task.

Graphics Generator templates are built and edited through a GUI, but other skills are helpful.

Navigating Directories

Knowing the directory structure of CHPS helps when you are managing files. The job can be completed more efficiently. If you need more information on the directory structure, see the CHPS Basic Configuration Course.

Familiarity with AHPS Products

Familiarity with the content and appearance of your office's AHPS products helps you spot Graphics Generator output problems. Look at your office's AHPS page to see what the products look like.

The products are standard, so when you start editing, do not deviate from the content and appearance of these charts!

Dataflow

An understanding of dataflow assists you in locating problems with product generation in the Graphics Generator environment.

For example, if a chart were missing the observed stage trace, you would go to the CHPS incoming data directory to see if the file was processed.

See the CHPS System Manager Course for more information.
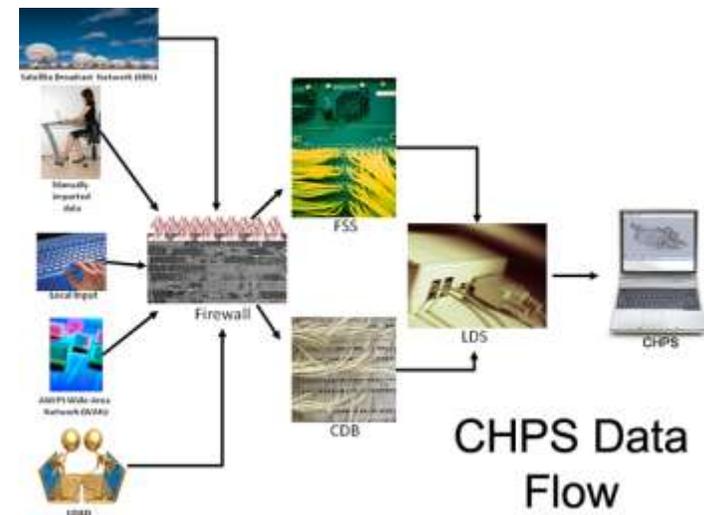
Becoming familiar with the components of Graphics Generator helps you efficiently build and edit templates to generate products.

This lesson describes the functions and behavior of the Graphics Generator interface.

By the end of this lesson, you should be able to:
- Identify the purpose of Graphics Generator interface components.
- Identify any interface behaviors different from other CHPS components.

Graphics Generator Components
Graphics Generator Components
Lesson 1.3 introduced Graphics Generator components. This presentation explains how the components work.
Graphics Generator Engine Works behind the scenes to complete several tasks: • **pull** product definitions and settings from the central **or** local area • **obtain** location information from the FEWS Pi-Service • **store** the data until needed by the editor, viewer, or thumbnail panel • **generate** output files
Also working in the background is the **Model Adapter**. The Model Adapter… • gets the definitions and settings from either the local or the central area (depending on the configuration), and • tells the Graphics Generator Engine to build the product and generate output files.
The interactive components of Graphics Generator are available when you open CHPS. Some of the components are panels or available from the **Tools** menu.
The **GraphGen Tree** is usually a minimized panel of the left side of the IFD. Maximize the panel to… • view a list of existing reference and product templates • delete, copy, rename, import, and export templates
Open the **GraphGen Editor** panel to edit templates selected from the GraphGen Tree. Access this interface by clicking the icon or from the **Tools** pull down menu.

The GraphGen Editor obtains data, products, and settings from several locations:

- selected product from the GraphGen Tree panel

- settings from the local area

- time series and location information from Pi-Service

The panel also issues a call to the Graphics Generator Engine to build and display the product.

The **GraphGen Thumbnails** displays all products for the currently active forecast segment.

The active segment id is pulled from the FEWS Pi-Service.

The Graphics Generator Engine takes the definitions and settings and creates products and thumbnails.

Access the **GraphGen Viewer** panel by clicking the icon in the toolbar.

The GraphGen Viewer displays products, which are pulled from either the GraphGen Thumbnails or GraphGen Tree panel.

Suggestion: Select the product from the GraphGen Thumbnails panel so the viewer does not have to rebuild

Recall from Lesson 1, Graphics Generator is integrated into the CHPS interface. The behavior of the components is the same or similar to other CHPS panels and tabs. Here is how it applies to Graphics Generator.

Interface

Docking and undocking behavior is the same as other CHPS IFD panels. You can "float" any of the Graphics Generator GUI components.

The dock/undock icons are outlined in orange on the image at right.

Having a panel undocked is helpful if you need the interface to be larger.

When docked, some panels are not wide enough to display all of the icons necessary for editing templates.
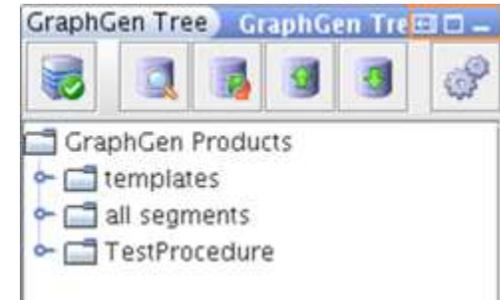
Note: The GraphGen Tree panel may not be wide enough to show all tool bar icons. Grab the right side of the box with the mouse and pull to the right to widen the panel.

File Handling

Simply saving files after editing templates is not sufficient. You cannot dump the plots or tables out of Graphics Generator unless you upload the settings and templates to the central area.

For products you create non-interactively (i.e., via a workflow), CHPS must be synchronized to the Central Database and have a Pi-Service connection.

Log Messages

Messages generated by the four **graphical** components of Graphics Generator output to the CHPS Log Panel and the **log.txt** file.

LESSON 4 TEMPLATE BUILDING AND EDITING

Building and editing templates correctly ensures your office produces quality, accurate output.

This lesson describes the process of building and editing templates.

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

- List the types of products Graphics Generator creates.
- Identify the chart components.
- Build templates.
- Edit existing templates and validate changes.
- Manage templates.

Graphics Generator Output Types
Introduction Graphics Generator produces output in various formats to meet customer needs. Contact the CHPS System Manager if your system is unable to create some of the outputs shown in this presentation.
Chart Based Images The most commonly used category of Graphics Generator output. Graphics Generator was designed to reproduce the information displayed in ESPADP charts. This information allows generation of AHPS products.
The content for other output types is drawn from the data generated for charts. Offices are discovering other uses for the capability.
XML Some users prefer the data in XML format. This option is available only for time series data. Errors occur trying to output non-time series information, such as scatter plots, to XML.
ASCII Tabular The ASCII tabular option outputs the numbers comprising a product into one or more tables. This capability is included since tabular output was an ESPADP capability; however, the format is significantly different.

Introduction: Although there are many output types, you only have to learn the components of the basic type of Graphics Generator output – the chart. The content of other types of products is derived from the chart series components of the chart (image) product.

Chart series are numbers – either x-y coordinates or time series. Chart series are computed and drawn using aggregators, calculators, and drawing parameters.

Subplots are supplemental plots in the chart area. You can have a different y-axis on a subplot than you do the main plot. The x-axis must remain the same.

Thresholds convey information on how the plotted information compares to certain criteria. For example, in this graphic, the precipitation is exceeding a level deemed important to forecasting or to a customer.

If a threshold is not configured for the probabilistic forecast, add a deterministic forecast to the chart, but do not display it. A threshold displays, but the deterministic forecast will not plot.

Plot Title provides information about the chart, in this case the location. If a plot title is specified, whatever was used as the last template's plot title appearance becomes **this** template's default appearance. The plot title appears only at the top of the plot.

Domain Axis, also known as the x-axis, is usually time-based, but can use other units. The axis includes tick marks, tick labels, and an axis label (one line only).

Range Axis, or y-axis, has the same features as the domain (or x) axis.

Subtitle provides additional information to what was provided in the plot title. The subtitle has more positioning options than the plot title.

Legend shows which series are shown in the chart. The position, appearance, and content of the legend are user-defined.

Zone refers to the shaded area between thresholds.

4.4 BUILDING AND EDITING

This section helps you determine whether building or editing is a better choice, and information on the key sections of templates.

Build or Edit?

First, decide if you are going to build a template, or edit an existing one.

Editing is best if an existing template creates a product similar to one you want to create. Adjusting the templates is less work than beginning with a blank template.

Building a new template is advised if a large number of changes are required.

The following pages outline the building and editing differences between reference and product templates.

Use the following job sheets to build and edit reference and product templates.

Job Sheet: Building and Editing Reference Templates | Building and Editing Product Templates

You need to check the definitions in the following key sections and upload the changes, regardless of whether you are building or editing a product or reference template.

Input Time Series
Whether you build or edit a template, you need to define or check the definitions in the following key sections.

Choose an **input time series**. What information do you want included in the output? You may need to change the input type if you are editing an existing template.

Arguments
Arguments are a way for a single template to apply to many locations/segments. You can use arguments in both reference templates and product templates.

Fixed vs. Relative Dates
Decide between **fixed** or **relative** dates.

Relative dates are relative to T0.

For example, AHPS uses a relative date of T0 + 30 days.

Fixed dates do not change.

Water supply outlooks use fixed dates. Users want to know the volume of water between certain dates.

Uploading

The changes you made are currently only saved in the local area. The local area is not intended for permanent storage. You need to upload any changes you want to keep permanently **or** share to the central area. Products and settings in the central area are considered ready for production.

Recall, product templates differ from reference templates. A few additional definitions are required when editing product templates.

Output Type

When creating product templates, think about what type of output (image, XML, etc.) you want to create.

If you edit a previous version of a product, you **must** change the file name. You do not want to overwrite the original file!

References

Consider using reference templates to save time. The definitions for the input time series and chart series are already completed.

Appearance

Define attributes such as titles, labels, and colors in the **Appearance** tab.

Validating Changes

Make sure the output looks like you planned. If not, check the settings in the reference and product templates. Make any necessary adjustments.

Keeping only the templates your office needs will reduce the number of files you have to maintain.

Copying Files

You can distribute finalized templates from the Graphics Generator Stand Alone. You can:
- Send templates to the Central Server via an Operator Client
- Add templates to another Stand Alone instance
- Disseminate products between offices

Deleting Templates

You need to delete templates, especially if you have been experimenting with different templates or you created templates for practice when familiarizing yourself with the system.

Uploading/Downloading Templates and Settings

You will need to manually download products and settings, especially if you are editing a lot and do not like the changes.

The application prompts you to upload your changes on exit. Consider uploading changes **while** editing templates if you think the current changes are ready for production use.

Note: Clicking the upload button replaces the definitions and settings in the central area with settings from the local area.

Creating Backup Files

Create a directory you know will not be overwritten during system upgrades. Another option is ensuring the central area is on a disk routinely backed up by your IT staff. Save products and templates to this directory, remembering to use version control. Be selective about the templates you upload.

The software developers suggest you save a copy of the AHPS template file, **ahpsInstallationImport.xml**.

Use the following job sheet to help you manage your office's templates.
Job Sheet: [Managing Templates](#)

LESSON 5 SOLVING GRAPHICS GENERATOR ISSUES

You can avoid most Graphics Generator issues by following best practices. If you do encounter problems, a basic understanding of troubleshooting techniques will help you identify issues with Graphics Generator more quickly.

This lesson provides Graphics Generator best practices and high-level overview of troubleshooting techniques. For information on specific problems, use the resources listed in this lesson.

By the end of this lesson, you should be able to:
- List several Graphics Generator best practices.
- Describe procedures used in general troubleshooting.
- Identify techniques used in Graphics Generator troubleshooting.
- Locate resources to assist with identifying solutions to Graphics Generator problems.

5.2 BEST PRACTICES

The best way to solve problems is to avoid them in the first place. Follow these best practices when using Graphics Generator to avoid errors when building templates. If you discover any best practices at your office, share them on the chps_ops listserv.

General Hints

Create a Stand Alone instance for building and editing Graphics Generator templates.

Graphics Generator does not intelligently synchronize templates defined in more than one Stand Alone. Consider this before loading from the central area.

Make sure the templates and settings in the local area match the central area. Do this by downloading from the central area.

Keep a written log of the changes you make to templates. It helps you track down issues quickly if the output looks different than you expected.

Building/Editing Sequence

Reduce potential problems by building and editing templates in the correct order. For instance, define plot titles and input series **before** appearance modifiers. Otherwise, the appearance modifiers will have nothing to change.

Design Tips

Use the GUI to add or modify a template. If you edit the XML, you could introduce errors.

Do not put appearance modifiers in reference templates. A template can be used many times.

Add display thresholds by adding a deterministic plot as an input time series. Another threshold display technique is outlined in the Graphics Generator Tips and Troubleshooting Guide.

Define reference templates for chart series appearing in more than one product. The depiction of the parameters is consistent. Updates to templates are easier because you change one reference template instead of many product templates.

Manage the number of products by using **arguments.** Arguments allow one product to be used for multiple locations.

Avoid confusion by using reference templates in product templates; not other reference templates.

Troubleshooting is a **logical** and **systematic** search for the source of a problem. Following the steps helps ensure you approach all problems with clear logic, eliminating more common errors before beginning more complex investigations.

A timely diagnosis and a thorough write up of the issues generally leads to a quicker resolution of the problem!

> **Note:** In most cases, you will not be asked to resolve any of these problems by yourself, but knowing about the different types of errors helps with the troubleshooting process.

Work from Common to Rare Possibilities

Identify and isolate the issue as a first step.

Start with the most probable and common issue, and progress to the least probable and uncommon issue. Consider the chart on the right.

If you have not seen this type of behavior previously, you should move from left to right and then top to bottom when searching for errors (User, Program, Computer, and System).

Types of Errors

You may need to troubleshoot several types of errors - **user**, **computer**, **system**, and **program** errors. Here are some tips for handling the various types of errors.

User errors are the most common and probable issues. User errors are typically incorrectly typing commands or not clicking the right part of a menu.

Computer errors typically occur on only one workstation. Make sure you are on a workstation with a Graphics Generator Stand Alone instance.

System errors are more widespread than user and computer errors, occurring on more than one Graphics Generator-configured workstation.

Program errors are problems that cannot be attributed to a particular user, workstation, or system. Program errors tend to occur after software upgrades.
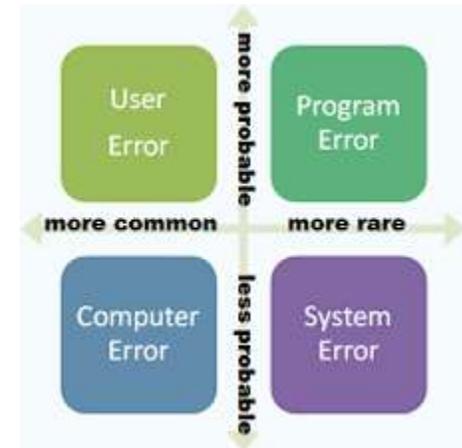
5.4 GRAPHICS GENERATOR TROUBLESHOOTING

The previous section outlined general troubleshooting steps. Here are some Graphics Generator specific steps.

1. Ask questions to identify or describe a problem.

    - What is the problem affecting; the interface, output, etc.?

    - What are the symptoms or indicators? Look in the Log panel for information.

    - Can the problem be recreated?

    - Is it an intermittent or constant problem?

2. Use the following questions to isolate the issue.

    - When did the problem begin?

    - Were there any software changes to the system recently?

    - Were template changes uploaded recently?

    - Could the issue be Pi-Service related?

3. Diagnose the situation.

    - Is it a known issue? Check the FogBugz site and search for similar problems.

    - Research known issues on RFC listservs.

    - Use information from this course.

    - Locate the Graphics Generator documentation.

4. Determine a course of action.

    - Document the steps you take (optional, but helpful).

    - Restart the application, is needed.

    - Report the problem on FogBugz.

    - Share what you learned with others.

5.5 RESOURCES

Finding answers to Graphics Generator questions is easier if you know where to look. Check out these resources for Graphics Generator information.

Graphics Generator Documentation

The [Graphics Generator documentation](#) includes a Tips and Troubleshooting guide. Many of the issues discussed in the document are XML configuration, but you will be able to assist the XML Focal Point with isolating the issue.

chps_ops listserv

Ask RFC colleagues for help on the chps_ops listserv. Use the information you gathered in the section above. Write a concise email, but do not leave out important details, such as if the problem appears to be workstation-specific. Click [here](#) to sign up for the chps_ops list if you are not already subscribed.

FogBugz

[FogBugz](#) is a bug tracking system for CHPS. Ask the DOH at your office for login credentials if you do not have them.

FogBugz provides a platform to report problems and receive consistent feedback with headquarters and other RFCs.

You can also browse the cases to see if another RFC had a similar problem.

This could save you time and provide quick solutions to issues. The FogBugz site also has links to OHD-created materials.

For more information on how to report a problem using FogBugz, use the instructions in the job sheet below.

Job Sheet: [Report Problems on FogBugz](#)

Building a Template

Congratulations. You reached the end of the course material!