

A Generic Solution to Running the SAS® System on the Web Without SAS/IntrNet®



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Introduction



- Why move SAS apps to the web?
 - ◆ Deployment flexibility
 - ◆ Less training/software required
 - ◆ Less SAS licenses required
 - ◆ Network access not needed
 - ◆ It's where SI is headed
- Barriers to entry
 - ◆ Cost
 - ◆ Administration

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Introduction

- Alternatives to SAS/IntrNet®
 - ◆ Static publishing to a web server (Can't produce dynamic content)
 - ◆ A custom CGI script that invokes SAS® see the PharmaSUG paper
 - Drawbacks include development effort and SAS needs to be installed on the web server
 - ◆ A TCP/IP socket-based approach
 - Dramatically increases performance
 - SAS can run on separate machines
 - Also see the NESUG2000 paper

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What If I'm Not Into Web?

- This presentation can still hold some value
- It illustrates just how powerful the SAS Component Language (SCL) is
- You can learn more about how the web works
- It is also a good example of:
 - ◆ How the socket access method can be used
 - ◆ How distributed computing works

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Topics of Discussion



- What can you do with SAS® and the web?
- Internet terminology
- Learn about Onyx
- Install and run Onyx
- Create sample programs that
 - ◆ Use ODS
 - ◆ Use SAS/AF
 - ◆ Display SAS/Graph output
- Learn how to obtain Onyx

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What Can You Do With the Web?

- Allow end-users to run SAS® programs and view output without using SAS®
- Create HTML output dynamically from procedures with ODS
- Create downloadable spreadsheets or other file types
- Create a GUI (front-end) for base SAS® programs without having to learn SAS/AF®
- Make your reports available to users around the world

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Terminology



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What is a Web Server

HTTP://

- Relatively simple software application
- “Server” that waits for “clients” to make requests
- Based on the nature of the request, decides what and how to serve the client what it asked for
- Can send back the contents of files or pass the request onto another helper application
- Written in almost any programming language including SAS!

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What is CGI

CGI

- A standard structure for a web server to invoke another application to handle a request
- Not bound to any particular programming language
- Defined by a set of environment variables that the helper application expects so that it can do its job properly
- How SAS/IntrNet works
- A common way of passing web-based requests to SAS
- Performance considerations

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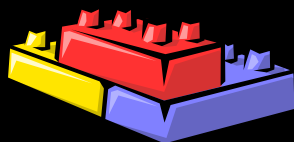
CGI Alternatives

- Java
 - ◆ Servlets
 - ◆ Java Server Pages
- ISAPI – Internet Server Application Programming Interface – Microsoft
 - ◆ Active Server Pages is one example
- Web server plug-ins like mod-perl

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What is a Socket

- A software object
- Provides a way for two processes to communicate
- One of the building blocks of the Internet
- Protocols – TCP/IP vs. UDP



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What is TCP/IP

- A network protocol
- TCP: Transmission Control Protocol
 - ◆ Breaks down data into packets
 - ◆ Reassembles them at their destination
- IP: Internet Protocol
 - ◆ Finds the destination and gets the message there

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Web Page vs. Dynamic Web Page



- A web page refers to
 - ◆ HTML document served to a web browser that usually exists on the web server
- A dynamic web page refers to
 - ◆ HTML document that does not exist on the web server, rather, it is created when the user requests it
 - ◆ Created by a CGI program or other in-process technique (like Java Server Pages, etc.)

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Learn About Onyx



- What is it?

From the Onyx docs:

"Onyx is a full-featured application server that can be used to control the SAS system in a unique way from any other software application, even on remote machines. Onyx fully and in a special way supports communication with the web (i.e. web pages) using CGI (common gateway interface), or other methods like Java Server Pages. Utilizing a unique TCP/IP protocol, SAS can be queried to perform a number of tasks using other applications like Java, Perl, Visual Basic, or C/C++. An advanced multi-threaded application server running in Java provides a transparent and load-balanced way to process SAS requests on any number of servers."

- The one sentence version

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Requirements

- Onyx Requires:
 - ◆ The Java Runtime Environment, freely downloadable at java.sun.com
 - ◆ The SAS® System version 8 or greater
 - ◆ No specific operating system

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The History of Onyx

- Why was Onyx written?
- Timeline (first released 1999)
- What has been developed using Onyx?
 - ◆ Web-based clinical data management software
 - ◆ Employee time tracking software
 - ◆ CRM solutions (ordering, service, etc.)
 - ◆ A Teacher's grade book
 - ◆ Financial analysis tools
 - ◆ Other applications we don't know about yet



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Key Features of Onyx

- Onyx includes the core functionality of SAS/Intrnet and more
- Many programs written for IntrNet can be run without modification
- Includes an integrated, extremely fast, **web server**, making it very easy to develop and test SAS® code on individual PCs or laptops
- Allows application developers to **re-distribute** their applications to sites that do not have Onyx, giving you the freedom to require only base SAS® for your web applications
- SAS® can be run from any number of different computers, even running different operating systems, with a load-balancing algorithm to distribute processing over the machines evenly.



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Key Features of Onyx

- Comes with a built-in interpreter for the **Onyx Dynamic HTML syntax (ODHTML)** which lets users use HTML editors to build pages that have embedded SAS® code within familiar `<% %>` tags.
- Is administered either via telnet or a web browser. Users can drop or add pooled SAS® sessions and check on the status of requests.
- Can easily be **customized** by SAS®/AF developers on the server side by adding new request types as SCL entries.
- Will run on any operating system that SAS® is licensed for.
- Requires nothing more than base SAS®.



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Beyond SAS/Intrnet®



- Easy URL syntax
- Re-distribution support
- Onyx Dynamic HTML syntax
- Easy retrieval of cookies and environment variables like username
- Intuitive debugging features
- Built-in web server for development
- OSAP/1.0
- Administered via web browser or telnet
- Can be customized

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How Onyx Works



- The Application Dispatcher – term used differently than with SAS/Intrnet®
 - ◆ Is a generic TCP/IP server serving...
 - ◆ SAS® requests
 - ◆ Web server requests
 - ◆ Administrative requests
 - ◆ SAS® Sessions registering themselves
- Differences between SAS/Intrnet®
 - ◆ The role of CGI
 - ◆ Client/Server
- Why many SAS® sessions?

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How is Onyx Built?

- SCL (Non-visual)
 - ◆ Virtually all SAS processing
- Java
 - ◆ Application Dispatcher (TCP/IP Server)



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How Onyx Works - OSAP



- About OSAP – the Onyx SAS® Application Protocol
- Typical request:

```
OSAP/1.0 Request: Program=/home/dward/run.sas
Session: 136068630613560398
Content-Length: 2

State=NJ
Product=Onyx
```
- What OSAP allows you to do
 - ◆ Easily make requests of Onyx from any programming language or tool, even telnet
 - ◆ Configure firewalls to accept OSAP requests
- OSAP Examples (osap.sas)

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Institute Products it Can Mimic



- Because of the wide open connectivity OSAP provides, Onyx can produce similar results to the following products:
 - ◆ SAS/Intrnet®
 - ◆ SAS/Connect®
 - ◆ Web/AF
 - ◆ Integration Technologies

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Installing and Running Onyx



- Onyx includes a windows installation wizard that will:
 - ◆ Install the Java Runtime Environment
 - ◆ Copy all system files to the proper locations on your server
 - ◆ Modify configuration files with default, working options
 - ◆ Install a Windows NT/2000 service if desired
 - ◆ Set up shortcuts to run Onyx
- Installing Onyx on a non-Windows machine

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Running Onyx

- Simply double click the icon or enter the appropriate command
- Administration
 - ◆ See status of available SAS® sessions
 - ◆ Start/Stop SAS® sessions
- Using the web-based administration utility
- Administration via telnet



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Using Onyx – Base SAS

- Our first example: Show all macro variables (sample1. htm)

```
Ods html file=_webout (dynamic);
Proc sql;
  select * from dictionary.macros
  where scope='GLOBAL';
Quit;
Ods html close;
```
- Show GET, POST, COOKIES, ENV_VAR
- Illustrate debugging capabilities with _onyxCheckLog
- Use an HTML form to POST data as well



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Using Onyx – Base SAS

- Our second example: print the output from a procedure (sample2.sas)

```
Ods html file=_webouta;
Proc means data=sashelp.prdsale;
  class country;
  var actual;
Run;
Ods html close;
```
- Show HTML and text output
- Illustrate the use of _webouta



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Using Onyx – Base SAS

- Our third example: Using sessions and a little bit of ODHTML (sample3.htm)
- How sessions work – directory/cookie/macro variables
- Sample program:
 - ◆ HTML form passes username to SAS
 - ◆ SAS Checks the username and if successful, gives a new link
 - ◆ The new link shows a page that uses a session data set.



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Using Onyx – ODHTML

- We have already seen some simple ODHTML syntax
- Our next example will show more detail... (sample5.dsas)
 - ◆ Using a file extension
 - ◆ Using ODS alternatively with HTML
 - ◆ ODHTML directives
 - ◆ Resolving macro variables and macros in the HTML
 - ◆ Using the data step to generate HTML



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Using Onyx – SAS/Graph

- Just like with IntraNet, you can
 - ◆ Write a graph directly back to the client as long as you set the appropriate Content-Type header
 - ◆ Write the graph to a directory accessible to the web server
 - ◆ Graph1.sas



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Using Onyx – SCL



- Onyx includes features that make developing web content with SCL easier
 - ◆ SCL is well suited for web scripting
 - ◆ Access to the Drone object with methods like clientData(), getvars(), putvars()
 - ◆ Virtual catalog access and compile-on-the-fly
 - ◆ Client data also available in SCL lists
 - ◆ Onyx Dynamic HTML for SCL
- Writing a request type



Using Onyx – Advanced Features



- Using servlets, etc.
- Using other clients than the web
- Re-distributing applications
- Customizing error messages
- Capturing drones
 - ◆ &_onyxCapture
- **Demonstration Applications**
 - ◆ Simple report builder
 - ◆ SAS explorer



Onyx Pricing

- Yes, we are actually showing you prices!
- Three tiers – Commercial, non-commercial, educational
- Purchase, not license



Obtaining Onyx

- Via our website:
 - ◆ <http://www.internext-inc.com>
 - ◆ Navigate to the software page where you can download the software and create an evaluation key
- Physical media available now
- Freely available for all alliance partners
- Getting help installing Onyx



What we learned

- Advantages of web-enabling SAS® reports and applications
- About web servers technology and how it can be used with SAS
- Benefits of web-enabling your SAS applications
- What Onyx is
- How to use Onyx
- How to obtain and install Onyx



Corrections/Suggestions



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