Regional Flash Flood Guidance Systems
An Operational Case Study: CAFFG

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Hydrologic Research Center
http://www.hrc-lab.org
Regional Flash Flood Guidance Systems

- System Design Constraints and Distinctions
  - Data Availability
  - Supporting Infrastructure
  - Policy and Protocol
  - Collaboratively Established Specifications

- System Description Abstractions
  - Data Products and User Interface
  - System Components, Processing Flow and Administration
  - Computational and Scientific Implementation
Regional Flash Flood Guidance Systems

CAFFG

System Overview
Regional Processing, National FFG Products
CAFFG System Unique Characteristics

- World’s first regional flash flood guidance system
  - Operational dissemination of both regional and small-scale products for all countries throughout Central America

- Fully-automated real-time operation
  - Data acquisition, ingest and quality control, model processing, output publication and data management

- Centralized acquisition, standardization and archive of disparate real-time data products throughout the entire region
CAFFG System Hardware

The CAFFG system is composed of two servers installed at the Instituto Meteorologico Nacional (IMN) in San Jose, Costa Rica

- **CAFFG Processing Server (CPS)**
  - Red Hat Enterprise Linux WS v4.5
  - Collects and standardizes numerous real-time data products, evokes various models to produce FFG and publishes output to the CDS

- **CAFFG Dissemination Server (CDS)**
  - Red Hat Enterprise Linux WS v4.5
  - Provides login-restricted, secure WWW and SCP access to various national data products for all CAFFG-participating National Meteorological and Hydrological Services (NMHS)
How Do Users Interact with the System?

- Participating Agency remote access to the CDS
  - ID/Password – Login-based access privileges
  - HTTPS - Secure (encrypted) and restricted web access
  - SCP - Secure (encrypted) and restricted data transfers
  - National Agency access to respective data only

- Administrative remote access to the CDS and CPS
  - SSH - Secure (encrypted) and restricted shell access

- Public access to sample regional products at HRC web site – http://www.hrc-lab.org/CAFFG/CAMI
CAFFG Dissemination Server (CDS)

CDS Design Overview
and
Graphical User Interface (GUI)
CAFFG Dissemination Server

- The CDS is designed for dissemination purposes only.

- The CDS graphical user interface (GUI) is designed to facilitate user review of available data products and to streamline an efficient process of remote data acquisition. (ArcView-formatted data composites)

- Data comparisons, quality control, revisions and response take place at each NMHS following remote acquisition of composite ArcView data tables.
CAFFG Dissemination Server (CDS)

Authorized Representatives Only

HTTPS Server
- Isolated Web Server Directories

SCP/SFTP Server
- Data Archives in National Accounts

scp or sftp

https
CAFFG Dissemination Server
Web Access GUI – Welcome Screen

Bienvenido al Servidor de Diseminación de CAFFG (CDS)
Por favor seleccione su área de acceso en la lista siguiente:

Representante Nacional
  HRC
  NOAA
  USAID
CAFFG Dissemination Server
Web Access GUI – National Data Interface

National Representative Access Only

Please select your dissemination region:
- Belize
- Costa Rica
- El Salvador
- Guatemala
- Honduras
- Nicaragua
- Panama

Central America Mitigation Initiative (CAMI)
Regional Operational Flash Flood Guidance

Public Information: English | Spanish
Restricted Access: HOME | HRC | NOAA | ULRAID | NATIONAL
Send comments to: cami_admin@hrc-lab.org

Most Recent Observations and Data Products

<table>
<thead>
<tr>
<th>Time-Scale</th>
<th>MAI</th>
<th>MAP</th>
<th>ASM</th>
<th>FFG</th>
<th>Prev FFG</th>
</tr>
</thead>
<tbody>
<tr>
<td>01-hr</td>
<td><img src="https://cds.imn.ac.co/NATIONAL/" alt="Image" /></td>
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<td>03-hr</td>
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<td>24-hr</td>
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</table>

Archive (requires WebACF)

ArcView Import Tables: Current, Archive
CAFFG Dissemination Server
Web Access GUI – Sample 3-hr GOES-12 HE Image

MCIDAS 03-HR IEN Precip
2004-12-09 03:00 UTC
CAFFG Dissemination Server
Web Access GUI – Sample 3-hr MAP Image

03-HR MAP
2004-12-09 03:00 UTC
CAFFG Dissemination Server
Web Access GUI – Sample 6-hr ASM Image

06-HR ASM
2004-12-09 00:00 UTC

rm/06hr
1.00
0.83
0.67
0.50
0.33
0.17
0.00
CAFFG Dissemination Server
Web Access GUI – Regional Data Products

Most Recent CAFFG Flash Flood Threat (FFT) Index
(updated/valid at 03Z, 09Z, 15Z and 21Z)

<table>
<thead>
<tr>
<th>National 03-hr FFT Index</th>
<th>Regional 03-hr FFT - 15Km Grid</th>
</tr>
</thead>
</table>

MCIDAS AREA Image (MAI) Regional Observations
(same updating schedule as national MAI products)

<table>
<thead>
<tr>
<th>MCIDAS 01-hr</th>
<th>MCIDAS 03-hr</th>
<th>MCIDAS 06-hr</th>
<th>MCIDAS 24-hr</th>
</tr>
</thead>
</table>

Pre-Processed Database MCIDAS Inventory: 24hr Catalog
CAFFG Dissemination Server
Web Access GUI – System Monitoring Resources

Pre-Processed Database (PREDB) Inventory:

<table>
<thead>
<tr>
<th>MCIDAS AREA Image data:</th>
<th>24hr catalog</th>
<th>10day catalog</th>
</tr>
</thead>
<tbody>
<tr>
<td>DCP Stage and Precip data:</td>
<td>24hr catalog</td>
<td>10day catalog</td>
</tr>
<tr>
<td>WMO Surface Met data:</td>
<td>24hr catalog</td>
<td>10day catalog</td>
</tr>
<tr>
<td>ALERT Precip and Surface data:</td>
<td>24hr catalog</td>
<td>10day catalog</td>
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Linux System Information:

- Reported Uptime
- Active Logs
- Active Processes
- Disk Space Usage
- Active CAFFG Cron Tab
- Active CAFFG Environment Variables

CAFFG CPS Backup Logs:

- CAFFG Database Dump Files Cleanup Log
- CAFFG Postgres Database Dump Log
- CAFFG Data Tape Backup Log
CAFFG Processing Server (CPS)

CPS Operational Design and Data Processing Overview
CAFFG Processing Server (CPS)

- **Pre-Processing**
  - Collect real-time data products from various sources
  - Archive real-time download files and data values

- **Processing**
  - Standardize real-time data and prepare numerous input data products
  - Execute Models
    - Satellite Rainfall Bias Adjustment
    - Surface Meteorological Interpolation (Gauge and Temperature)
    - Basin Mean Areal Precipitation and Mean Areal Temperature
    - Soil Moisture and Flash Flood Guidance
  - Archive model output and state parameters

- **Post-Processing**
  - Create graphical products of processed data and model output
  - Prepare data products and reports for web publication
  - Upload images, data and reports for web dissemination and archive
June 12, 2007
Jason Sperfslage
www.hrc-lab.org
DCP Stations (Precip, some Temp)

CAFFG Real-Time DCP Stations (via TCP through DAPS/DCS)
ALERT Stations (Precip, some Temp)

CAFFG Real-Time ALERT Stations (via SCP through ACP/HRC)
WMO METAR Stations (Temp)

CAFFG Real-Time WMO METAR Stations (via FTP through NOAA)

Caribbean Sea

Pacific Ocean
Concluding Remarks

- **System Status**
  - Operational since June 2004
  - Hands-on Operator training completed and continuing
  - Recent hardware upgrade and system administrator training completed

- **CAFFG Product Validation**
  - Validation is ongoing, with encouraging results

- **Transferability for global application**
  - Plans for implementation with weather radar data in: Romania, Southeast Asia, South Korea and South Africa
  - Plans for global implementation with satellite precipitation data

- **Additional information at http://www.hrc-lab.org**
South Africa Flash Flood Guidance (SAFFG)
Feasibility Assessment – June 2007

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Theresa Carpenter, Hydrologic Engineer
Jason Sperfslage, Software Engineer

Thank you!