

Architecting Net-Centric Access to Environmental Intelligence

A Decision Support Driven Pilot

Ground System Architectures Workshop 2012

29 February 2012

Morris Brill
Fritz VanWijngaarden

Acknowledgements



- Gary Fox, Northrop Grumman
- Ron Lowther, Ph.D., Chief, Information Systems Branch, Global Systems Division, NOAA. (formerly Northrop Grumman)

Agenda



- Voice of the Customer
- A Word About Net-Centricity
- The Pilot
 - Scenario
 - Display Concept
 - Use Cases
 - Products Developed
- Summary and Lessons Learned

- **Climate change and energy competition may** produce second-order effects for national security as states anticipate the effects of global warming (e.g., by contesting water resources in regions with limited potable sources) and seek to secure new energy sources, transport routes, and territorial claims

The National Intelligence Strategy, August 2009. Office of the DNI, September 2009

- To these persistent threats we add a growing array of **emerging missions that expands the list of national security (and hence, intelligence)** concerns to include infectious diseases, science and technology surprises, financial contagions, economic competition, **environmental issues**, energy interdependence and security, cyber attacks, threats to global commerce, and transnational crime

Vision 2015: A Globally Networked and Integrated Intelligence Enterprise, Director of National Intelligence, 2008

- “The scientific community has not been able to issue specific warnings, but worries increase that a **tipping point has been reached in which climate change has accelerated and possible impacts will be very destructive**”

Global Trends 2025: A Transformed World. Office of the DNI, November 2008

An Operational Net-Centric Approach Enables our Customers to
Observe Globally, Assess Regionally, Act Locally

Our Effort is Driven by Environmental Initiatives



Much has been written, and discussed about climate change and its potential underlying causes

Much has been written and discussed about the catastrophic consequences if climate change proceeds unabated

Little has been done to establish an integrated scientific approach for the monitoring, forecasting, mitigation and adaptation

Continuous Monitoring and Accessible Information Is Essential for the Development and Refinement of Adaptation & Mitigation Policies

Scenario Introduction for Integrated Environmental Intelligence



- Thread Title

Climate Change and Disasters Induced Tipping Points in Mexico

- Summary

Disasters such as hurricanes, monsoons, earthquakes, and health crises (e.g., pandemics) will likely exacerbate climate change and population induced trends in clean water scarcity, drought and desertification, rising sea levels, and crop yields in Mexico. The intelligence derived from such hypothetical scenarios can then be used by decision makers and policy makers to assess national security implications

- Description

The scenario will exploit climate change data derived from models and trends to identify areas that are impacted by climate and population change trends. The scenario will incorporate hydrological and agriculture inputs as they impact the population

- Approach

Extend the System of Integrated Regional Environmental kNowledge (SIREN) by adding a Community of Practice (COP) for accessing and assessing climate (water, drought, desertification, rising sea level) and population data. This entails using existing features to keep the same look and feel and extends our capabilities to address issues of interest to communities of interest

The Scenario Requires a Net-Centric Approach



- We use the following applicable definitions of net-centricity
 - “To realize the vision for net-centric data, two primary objectives must be emphasized: (1) increasing the data that is available to communities or the Enterprise and (2) ensuring that data is usable by both anticipated and unanticipated users and applications.”

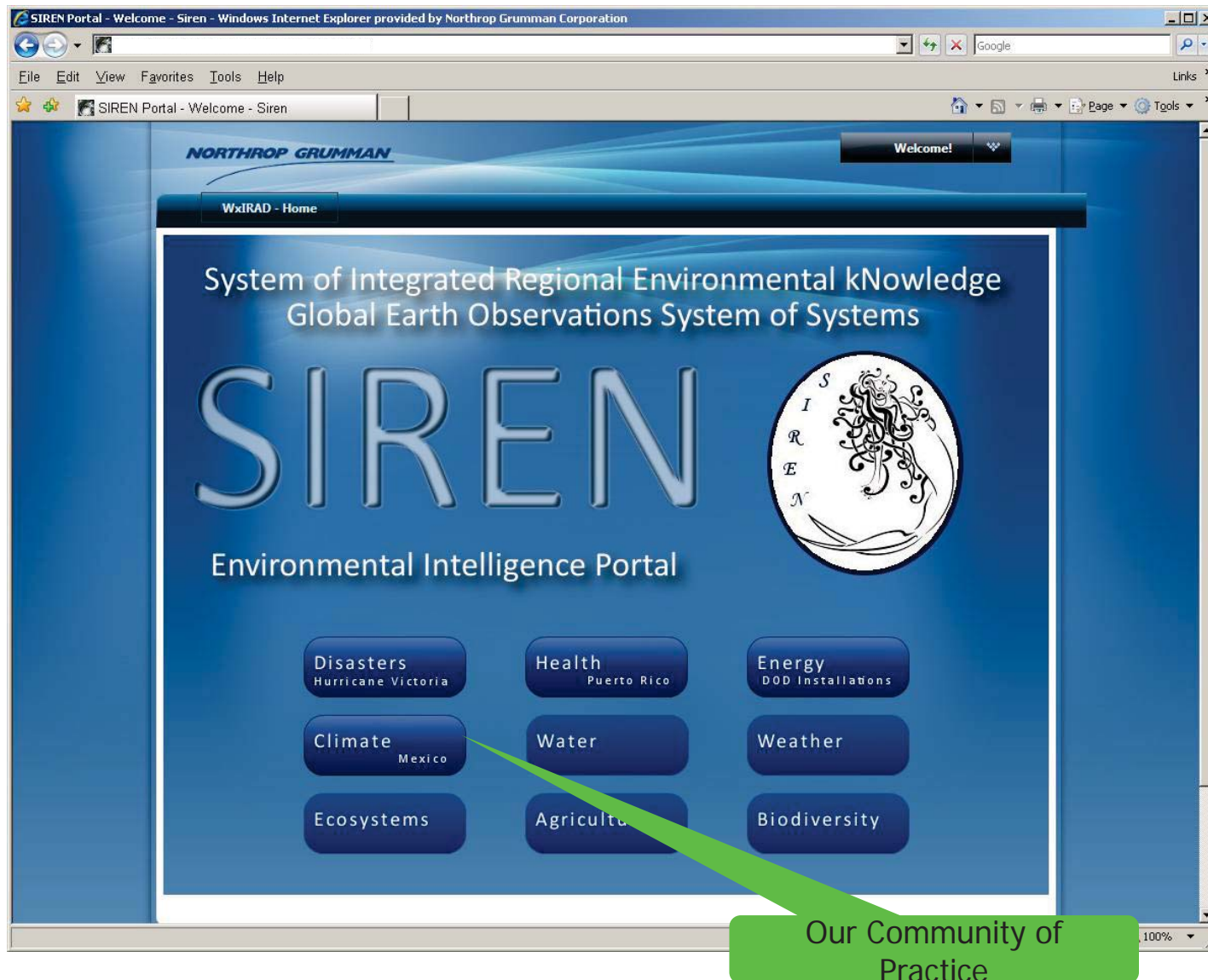
Department of Defense Net-Centric Data Strategy, May 9, 2003, DoD CIO
 - “**Net-Centric:** Exploitation of advancing technology that moves from an application centric to a data-centric paradigm – that is, providing users the ability to access applications and services through Web services – an information environment comprised of interoperable computing and communication components.”

Net-Centric Checklist, May 12, 2004, Version 2.1.3, Office of the Assistant Secretary of Defense for Networks and Information Integration/Department of Defense Chief Information Officer

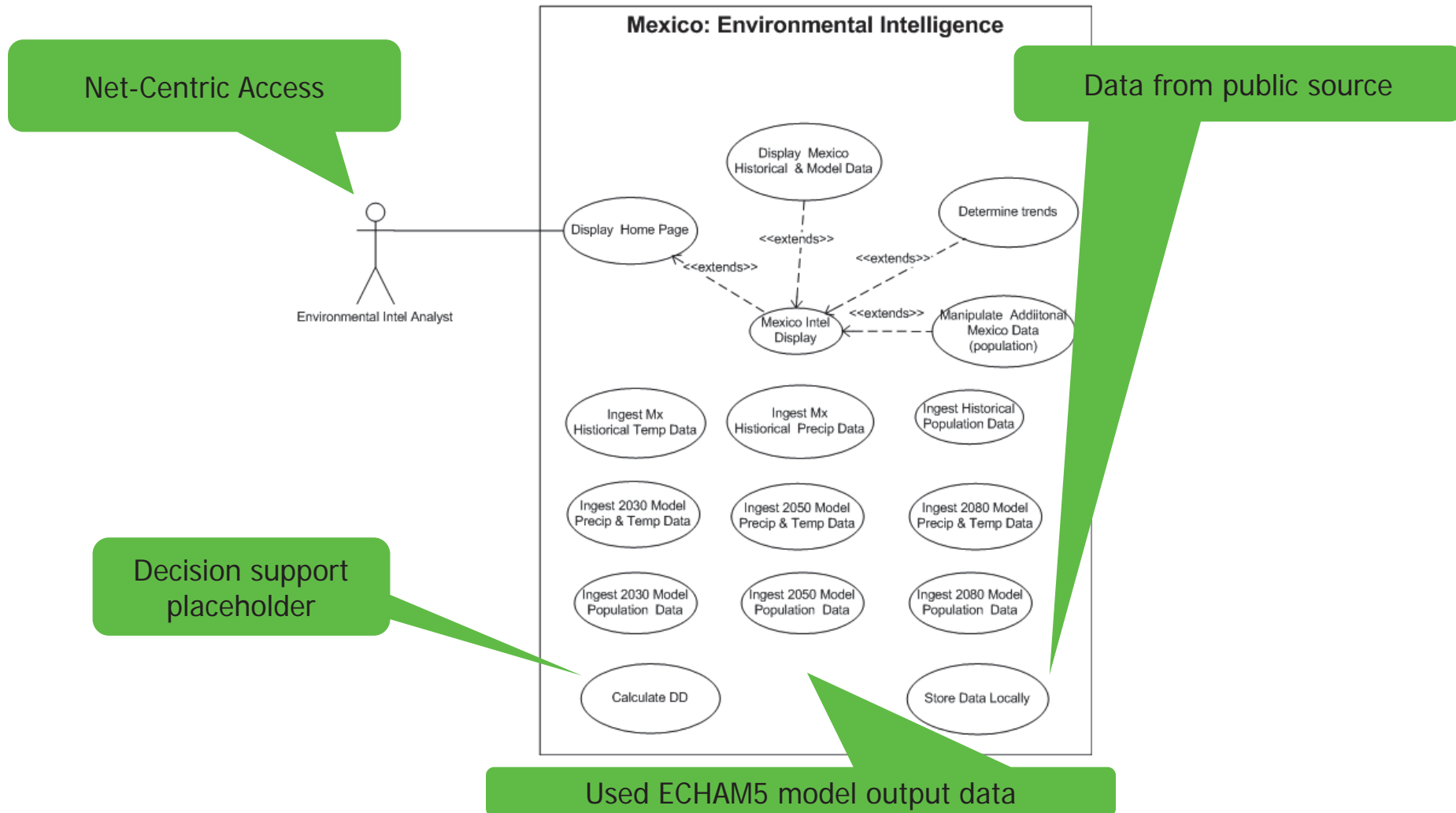
Building Upon Previous Climate Efforts: Common Platform Accelerates Time to Market



- Promotes “standardized” extensibility
- Open source and COTS products used



Initial Use Cases (SV-4) Focused on Ingesting and Visualizing Climate Data

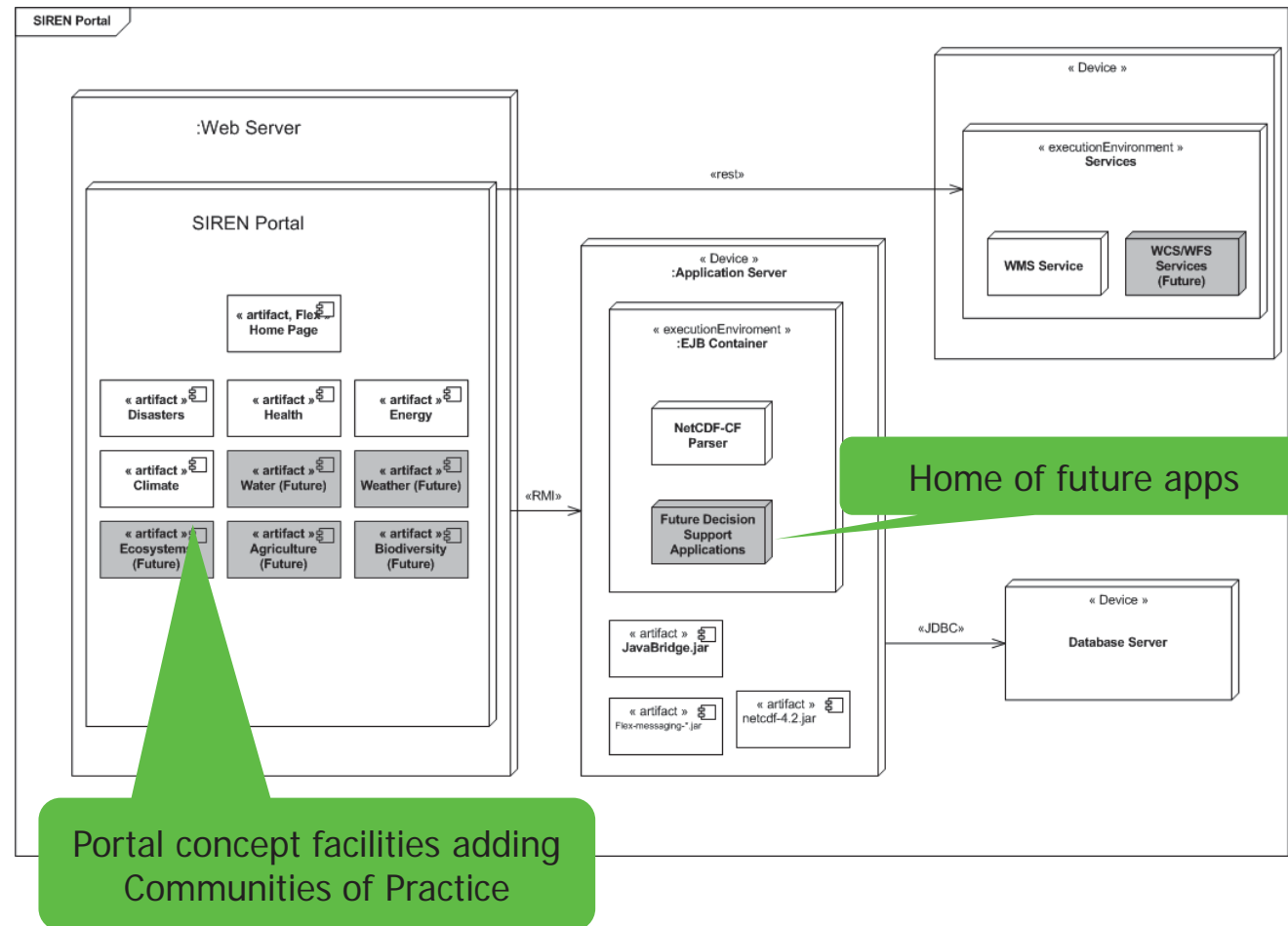


Access is Web Based

The SIREN Deployment Diagram (SV-1) Points to Areas for Accessibility and Extensibility

Sampling of Products and Standards Used

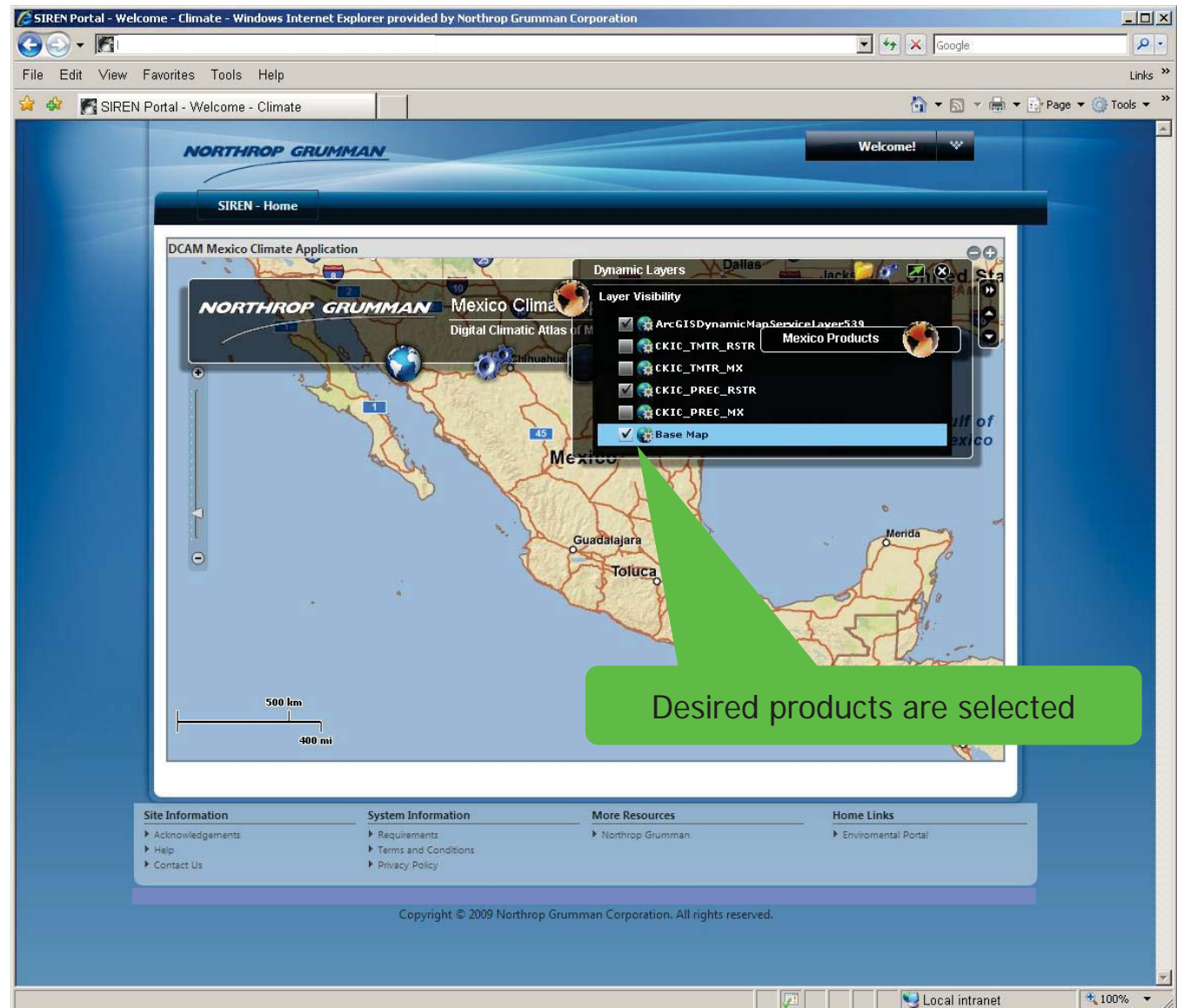
- Products
 - COTS
 - Open source
- Standards
 - Java Database Connectivity (JDBC)
 - JavaScript Object Notation (JSON)
 - Remote Method Invocation (RMI)
 - Web Map Service (WMS)
- Other
 - Representational State Transfer (REST)



Architecture Supports Additions of CoPs and Decision Support Tools

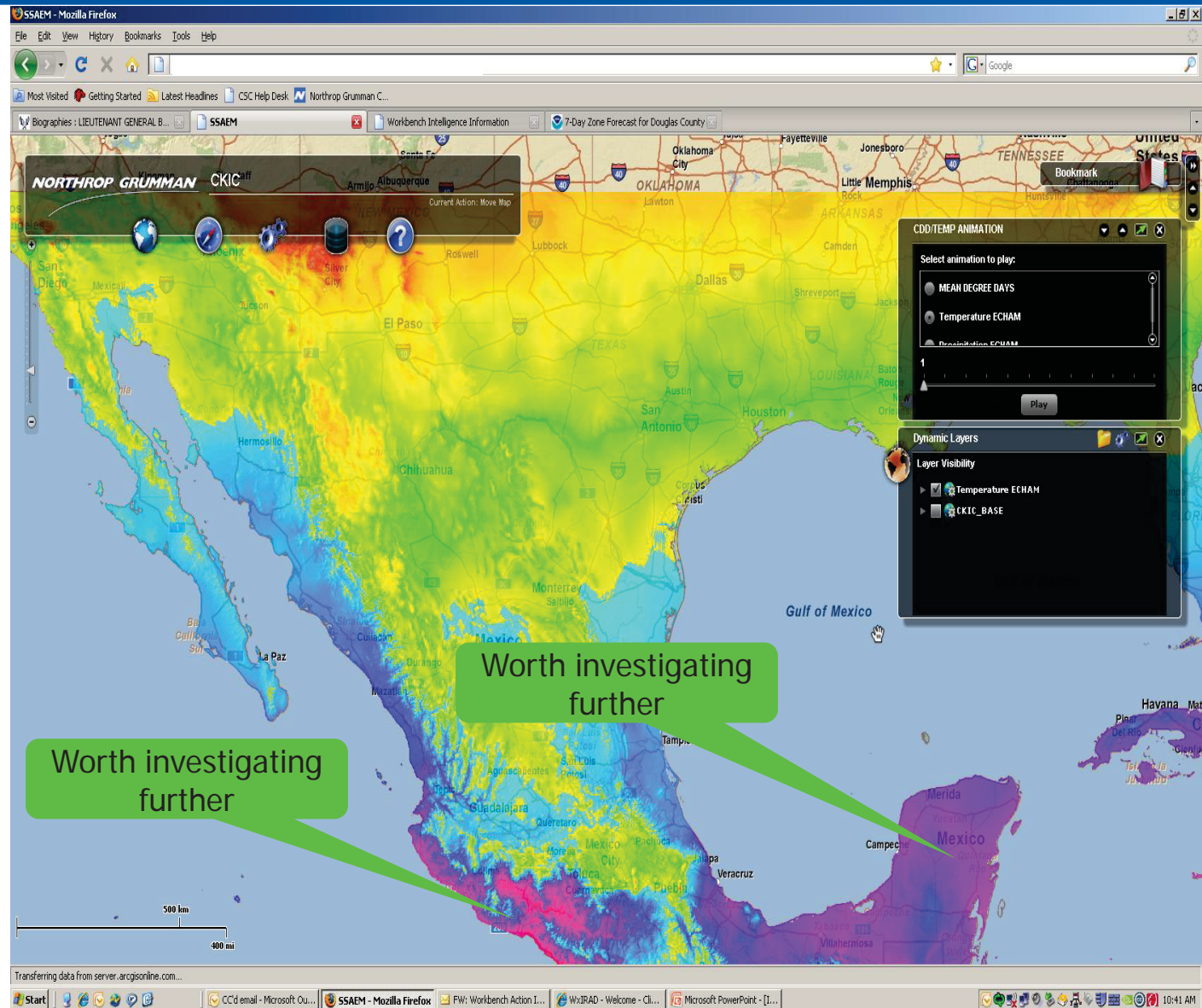
Presenting Choices to the Analyst

- Temperature, precipitation layers are available to the analyst
- Highways and city locations allow for quick visual, geospatial orientation



Initial Product: Temperature View May Indicate One Starting Point

- GIS Mexico view
- Temperature data (ECHAM5) global climate model run 2030 data
- Overlaid with highway data
- Heat zones:
 - Yucatan Peninsula, Pacific Coast
 - May indicate areas of desertification
 - Incipient population shifts



Summary and Lessons Learned (1 of 2)



- Scenario first approach does facilitate getting buy-in earlier and gets stake-holders excited (versus a technology first approach)
 - We developed the scenario first and distributed the scenario drafts to key subject matter experts and staff previously employed by appropriate government agencies (e.g., Air Force Weather Agency, NOAA)
- Access to data is essential. Web accessibility is our net-centric approach
- Demonstrate early and demonstrate often. Demonstrate to elicit drivers, issues, and ideas from audiences. Use these to evolve capabilities so that scenario(s) resonate with customers

- Use audience-friendly DODAF views to communicate key concepts in early demonstrations
 - Tailored views to our audience of meteorologists and climatologists (i.e., not system engineers) helped to draw in (internal) buy-in—we kept it simple. This was not a system engineering exercise
 - Generated DODAF views that are focused on addressing how model data is accessed by environmental intelligence analysts through net-centric means
 - Activity diagram, OV-5 is one example
 - Presenting views to customers makes clear that there is a process being followed
- What is working well for the CoP approach
 - Uses common standards, services (e.g., WMS), and applications
 - Extends the framework used by other efforts for “fast to market” concepts
 - Building from a baseline avoids startup costs associated with building from scratch
 - Incorporates suggestions from previous potential customers
 - Delivers technical climate model data for use by non-climate science individuals in their areas of expertise

Thank You



Authors

Morris Brill

Chief Systems Architect

Fritz VanWijngaarden

Integrated Environmental Intelligence (IEI) IR&D Co-PI

Northrop Grumman

One Space Park

Redondo Beach, CA 90278

Point-of-Contact

Morris Brill

310.813.2638

morris.brill@ngc.com

THE VALUE OF PERFORMANCE.

NORTHROP GRUMMAN

