

Banyan

Information Management System

The power of collaborative, clear thinking

**Developing a Web Based,
Collaborative,
Semantic Information Manager**

R. H. Barter

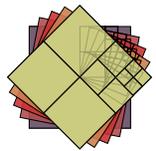
December 14, 2005

**This work was performed under the auspices of the U.S. Department of Energy
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Lawrence Livermore National Laboratory, P.O. Box 808, Livermore, CA 94551

Overview

- Banyan is a Product and a Process for solving complex problems
- Manages engineering information for two weapon systems
- Directly applicable to assurance management



Banyan Manages Documents, Information, & Semantics

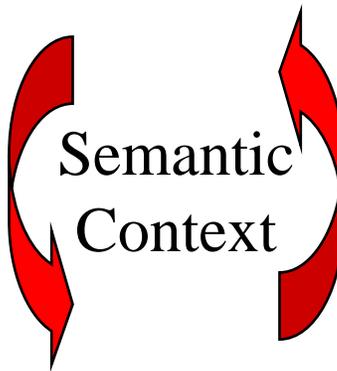
Document



Information

2.1 Risk-Based Program

extent (tailoring) of application of QC-1 requirements. An organization shall use a risk management process when choosing to apply the "shall" requirements of this document in a graded (tailored) manner and document that process in their QAP or WQAP. Factors that may be considered in the risk



Information

4. OBJECTIVES

- Apply QA measures to work activities in a cost-effective manner based on the maturity, applicability and risk associated with the activity



Document



Background

- Search for an engineering information management tool
 - Commercial (closed): general purpose, application specific
 - Open Source
 - Standalone
 - Client-server
 - Web based
 - Technologies
 - Java
 - Perl, PHP
 - Python
- Narrowed the search (technology watch)
 - Java/struts/tomcat
 - Python/Zope/Plone
- Along came ADAPT
NNSA, Advanced Design and Production Technologies

Background

\$3M ADAPT project – developed for a Life Extension Program

- 12,000 documents
- 1,300 information elements
- 700 risk-based activities

Banyan paid for itself in its first month of use through the risk-based prioritization of certification activities

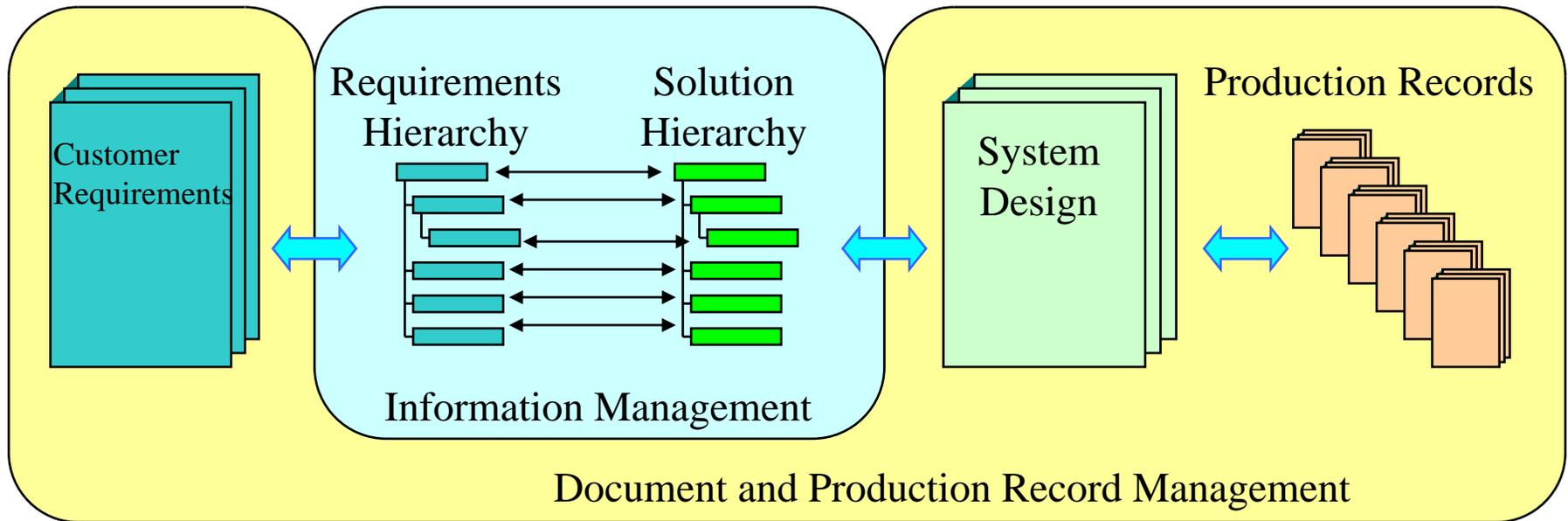
Our Experience in W-Program

- Required for certification
- Unambiguous traceability
 - Customer requirements
 - Tests
 - Simulations
 - Surveillance activities
- We are playing a key role in RRW



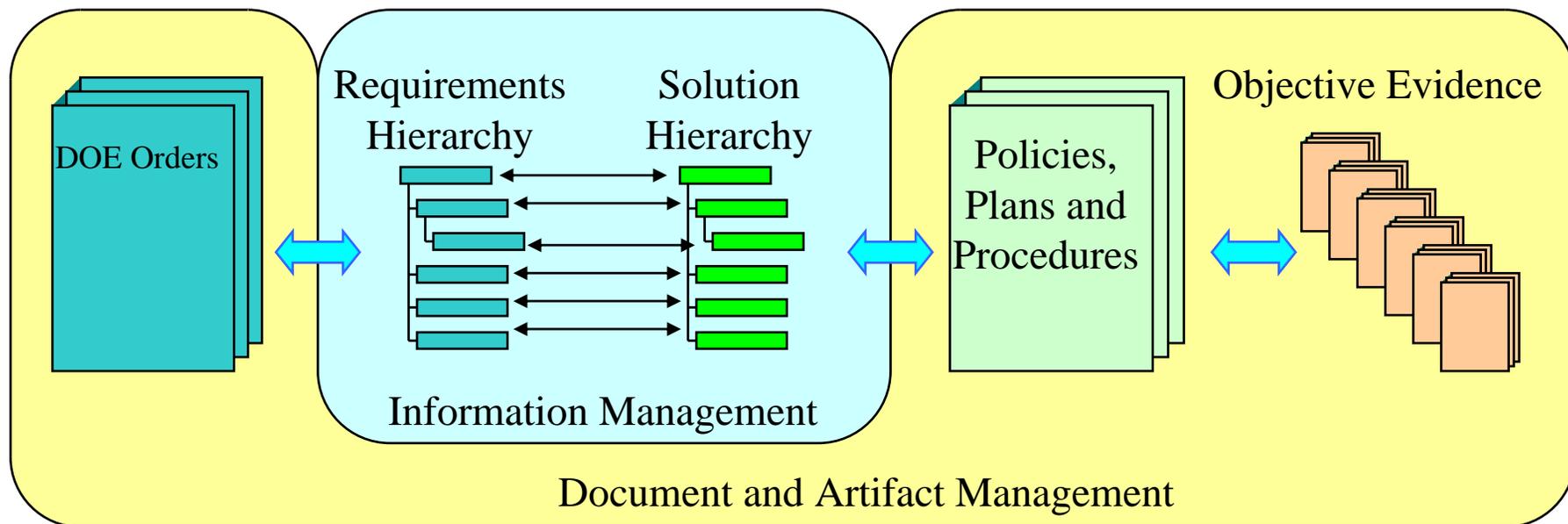
**Unambiguous traceability
forms the backbone of the
certification effort**

Banyan as an Engineering Tool

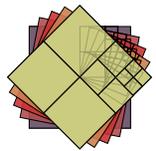


Unambiguous traceability

Banyan as an Assurance Manager



Audit-proof Compliance



Unambiguous Traceability

The screenshot displays the Banyan Engineering Information Manager interface. The top navigation bar includes the Banyan logo and the text "Engineering Information Manager". Below the navigation bar, the browser address bar shows "banyan na-121 demo site" and "banyan 2.0". The main content area is divided into three panels:

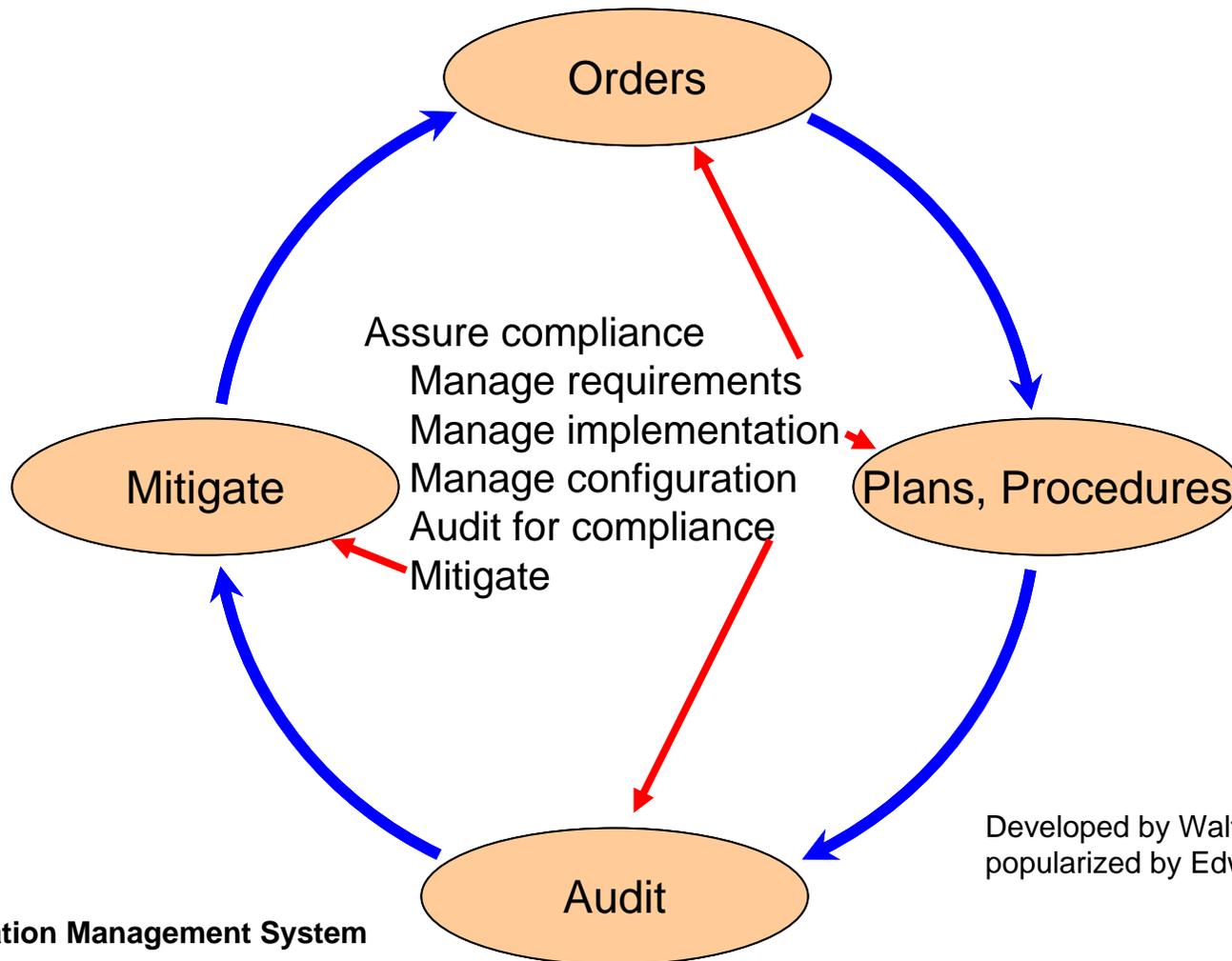
- Engineering Information:** A sidebar with tabs for "requirement", "plan", and "issues". The "source_document" tab is active, showing a tree view with "Source_Document" and "QC-1".
- Information Categories for :QC-1:** A tree view showing a hierarchy of categories: "QC-1 Rev 10 Final 2004-02-13.xml", "1.0 INTRODUCTION", "1.1 SCOPE", "1.2 SUPPLEMENTAL POLICY AND INSTRUCTIONS", "BASIC REQUIREMENTS", and "2.1 Risk-BAsed Program". A link is shown: "Link To: QC-1 Rev 10 Final 2004-02-13.xml".
- Details for : 2.1 Risk-BAsed Program:** A detailed view of the selected category. It includes a "[banyan_edit]" button and a "Description" section: "To have a cohesive, effective and integrated quality management system, a risk-based approach must be used to determine the extent (tailoring) of application of QC-1 requirements. An organization shall use a risk management process when choosing to apply the 'shall' requirements of this document in a graded (tailored) manner and document that process in their QAP or WQAP. Factors that may be considered in the risk management process for graded application include".

The screenshot displays the Banyan Engineering Information Manager interface for a different document. The top navigation bar and browser address bar are identical to the previous screenshot. The main content area is divided into three panels:

- Engineering Information:** A sidebar with tabs for "requirement", "plan", and "issues". The "source_document" tab is active, showing a tree view with "Plan" and "DNT Quality Assurance Plan".
- Information Categories for :DNT Quality Assurance Plan:** A tree view showing a hierarchy of categories: "DNT_QAP.02-1-30-02.xml", "INTRODUCTION", "MISSION", "SCOPE", "OBJECTIVES", "6. OPERATIONAL CONDITIONS AND INTERFACES", "7. RESPONSIBILITIES", "8. Quality Assurance Requirements", "8.1 Quality Assurance Criteria", "8.1.1 Category 1?Management Group", "8.1.2 Category 2?Performance", and "8.1.3 Category 3?Quality Assurance". A link is shown: "Link To: DNT_QAP.02-1-30-02.xml".
- Details for : 8.1 Quality Assurance Criteria:** A detailed view of the selected category. It includes a "[banyan_edit]" button and a "Description" section: "The LLNL Quality Assurance Program has program based on DOE Order 414.1A and 1. categories: Management, Performance, and approach." Below the description is a table:

Risk Level	Management
High	<ul style="list-style-type: none">Quality Assurance PlanTraining and qualification of operator and workersQuality improvementDocumentation and record control

Banyan supports management processes



Developed by Walter Shewhart and
popularized by Edwards Deming



BANYAN
Engineering Information Manager



banyan demonstration system

admin

Banyan Demonstration System

- ⌵ **Engineering Section**
- ⌵ **Document Storage Area**
 - System Documentation
 - Analyses
 - Meetings
 - Development
 - Production
 - Surveillance
 - Tests

⌵ **Engineering Section Reports**

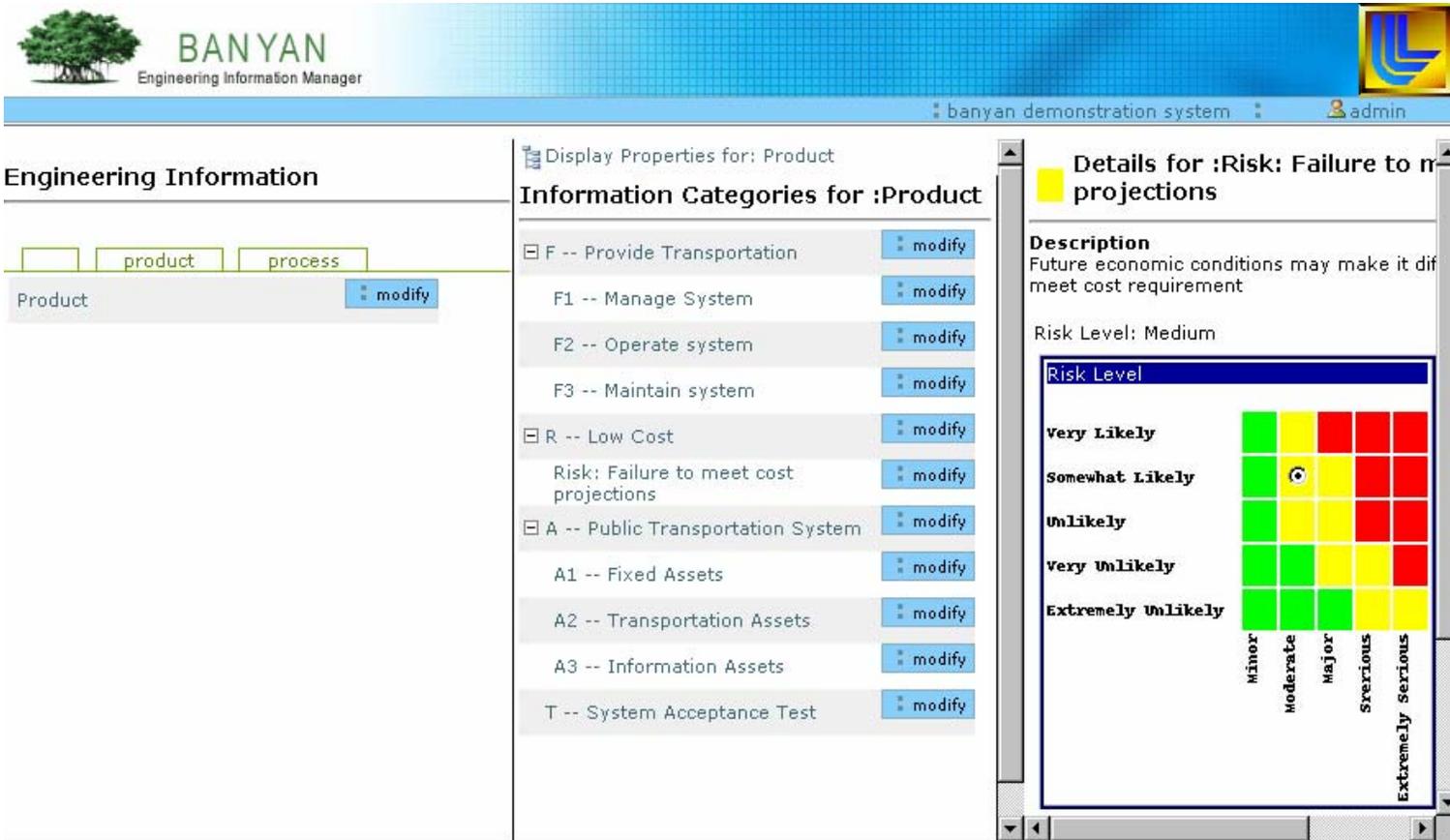
⌵ **Search Documents for:**

⌵ **Search Document Storage Area**

⌵ **Search Engineering Section**

⌵ **Configuration**

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BANYAN
Engineering Information Manager

banyan demonstration system admin

Engineering Information

product process

Product [modify](#)

Display Properties for: Product

Information Categories for :Product

- F -- Provide Transportation [modify](#)
 - F1 -- Manage System [modify](#)
 - F2 -- Operate system [modify](#)
 - F3 -- Maintain system [modify](#)
- R -- Low Cost [modify](#)
 - Risk: Failure to meet cost projections [modify](#)
- A -- Public Transportation System [modify](#)
 - A1 -- Fixed Assets [modify](#)
 - A2 -- Transportation Assets [modify](#)
 - A3 -- Information Assets [modify](#)
- T -- System Acceptance Test [modify](#)

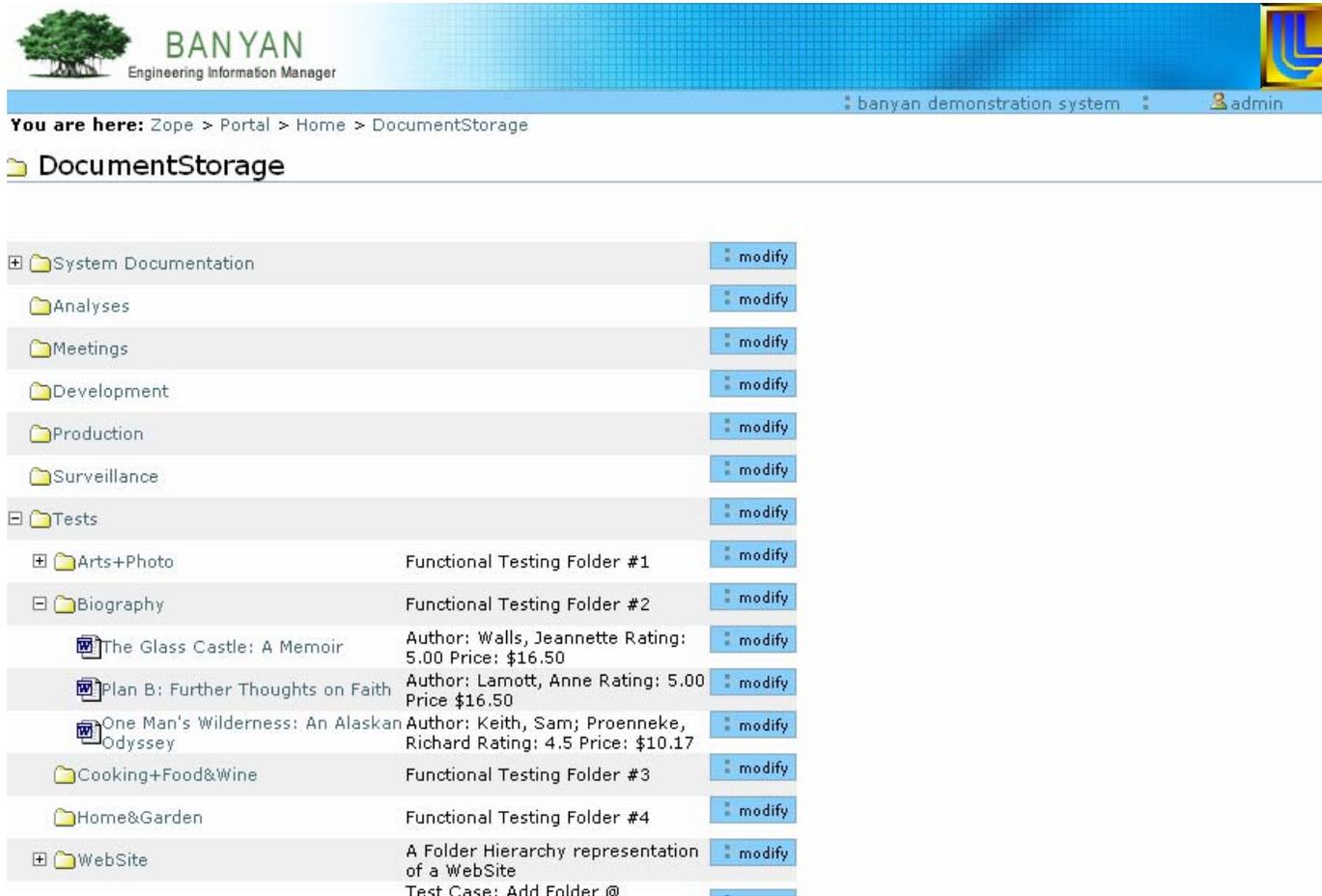
Details for :Risk: Failure to meet cost projections

Description
Future economic conditions may make it difficult to meet cost requirement

Risk Level: Medium

Risk Level		Minor	Moderate	Major	Serious	Extremely serious
Very Likely		Green	Yellow	Red	Red	Red
Somewhat Likely		Green	Yellow (with mouse cursor)	Yellow	Red	Red
Unlikely		Green	Yellow	Yellow	Red	Red
Very Unlikely		Green	Green	Yellow	Yellow	Red
Extremely Unlikely		Green	Green	Green	Yellow	Yellow

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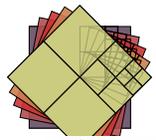
BANYAN
Engineering Information Manager

banyan demonstration system admin

You are here: Zope > Portal > Home > DocumentStorage

DocumentStorage

+	System Documentation		modify
	Analyses		modify
	Meetings		modify
	Development		modify
	Production		modify
	Surveillance		modify
-	Tests		modify
+	Arts+Photo	Functional Testing Folder #1	modify
-	Biography	Functional Testing Folder #2	modify
	The Glass Castle: A Memoir	Author: Walls, Jeannette Rating: 5.00 Price: \$16.50	modify
	Plan B: Further Thoughts on Faith	Author: Lamott, Anne Rating: 5.00 Price \$16.50	modify
	One Man's Wilderness: An Alaskan Odyssey	Author: Keith, Sam; Proenneke, Richard Rating: 4.5 Price: \$10.17	modify
	Cooking+Food&Wine	Functional Testing Folder #3	modify
	Home&Garden	Functional Testing Folder #4	modify
+	WebSite	A Folder Hierarchy representation of a WebSite Test Case: Add Folder @	modify



Process Modeling with Kepler

Engineering Information

Product

Information Categories for :Product

- F -- Provide Transportation
- F1 -- Manage System
- F2 -- Operate system
- F3 -- Maintain system
- R -- Low Cost
- Risk: Failure to meet cost projections
- A -- Public Transportation System
- A1 -- Fixed Assets
- A2 -- Transportation Assets
- A3 -- Information Assets
- T -- System Acceptance Test

Details for :Risk: Failure to meet cost projections

Description
Future economic conditions may make it difficult to meet cost requirement

Risk Level: Medium

Risk Level

Very Likely	Very Likely	Very Likely	Very Likely
Somewhat Likely	Somewhat Likely	Somewhat Likely	Somewhat Likely
Unlikely	Unlikely	Unlikely	Unlikely
Very Unlikely	Very Unlikely	Very Unlikely	Very Unlikely
Extremely Unlikely	Extremely Unlikely	Extremely Unlikely	Extremely Unlikely

Web Services

Web Services

jar:file:/C:/Kepler-1.0.0alpha3/ptll4...figs/kepler/workflows/orb/OrbModel.xml

File View Edit Graph Debug Help

Actors Data

Quick Search

Workflow Components

- Directors
- Actors
 - Mathematical Operations
 - Control
 - Image Manipulation
 - Grid Functions
 - Web Services
 - Web Service Harvester
 - Web Service
 - Datamining
 - Domain Specific
 - External Execution Environm
 - Inputs
 - Constants
 - Converters
 - Complex Structures
 - Outputs
 - GIS Functions
 - String Functions
 - Variables

0 results found.

PN Director

OrbWaveformSource

Const1

Const2

Const3

Multiplexor

Multiplexor2

Multiplexor3

AddSubtract

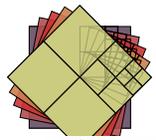
MonitorValue

XYPlotter

Author: Tobin T. Fricke

This model shows a simple use of the Antelope ORB interface. MGENC packets (containing multiplexed channels of streaming data) are gathered from the ORB. The samples from these multiplexed channels are output from OrbWaveformSource to a multiplexor. The Multiplexor actors select individual channels, which can be combined in arbitrary ways. The result is displayed as a plot.

This "times" relation transfers a timestamp for each sample.



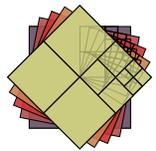
Ontology Manipulation with Protégé

The screenshot shows the Banyan Information Management System interface. On the left, there's a navigation pane with 'Engineering Information' and a tree view showing 'Product' and 'process'. The main area displays 'Information Categories for :Product' with a list of categories like 'F -- Provide Transportation', 'F1 -- Manage System', etc., each with a 'modify' button. A 'Details for :Risk: Failure to n projections' panel is open, showing a 'Description' and a 'Risk Level: Medium' with a color-coded grid.

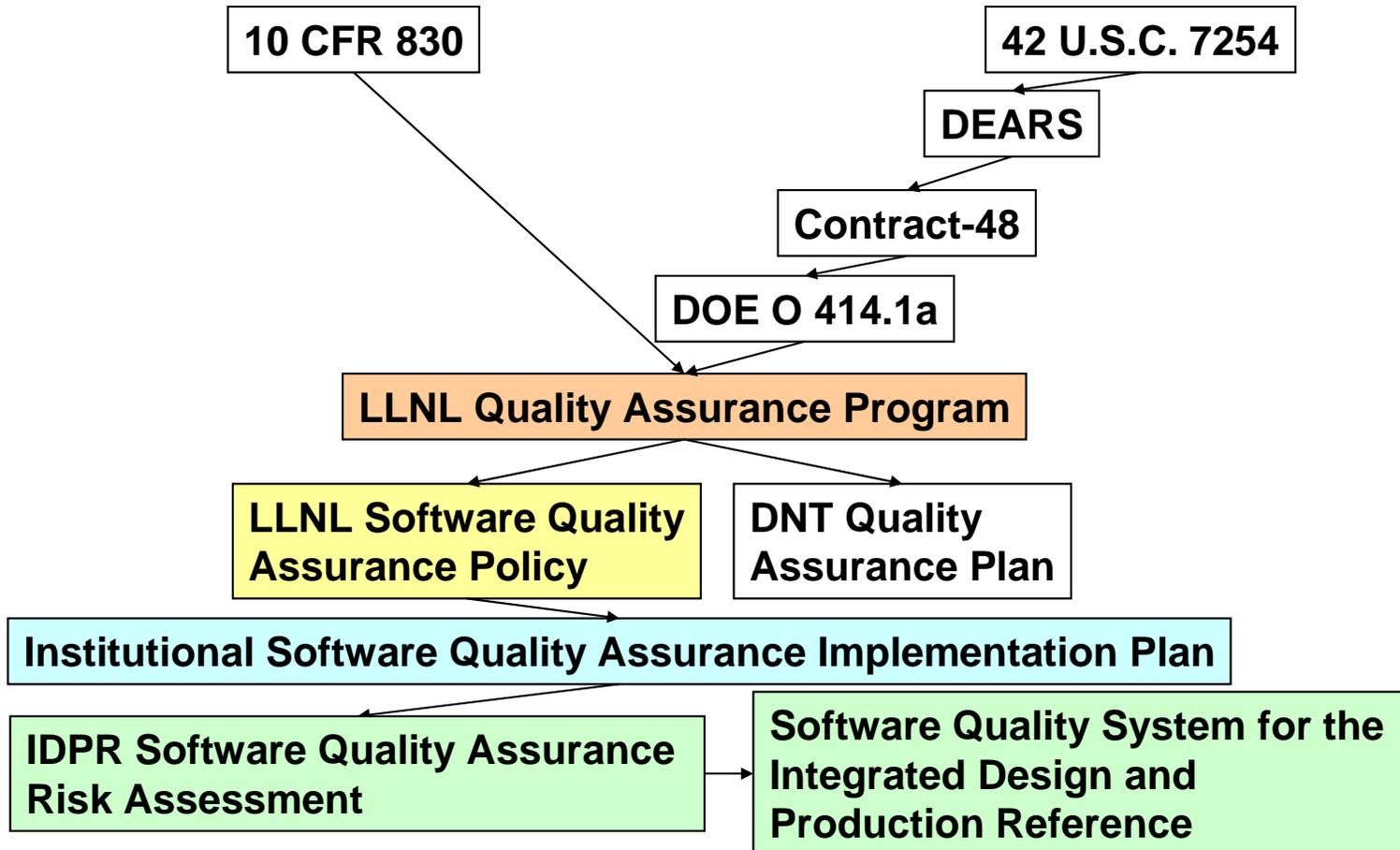
Web Services

The screenshot shows the Protégé Query View for a 'newspaper' ontology. The main area displays a complex graph of nodes and arcs. Nodes include 'Anne BasketballHead', 'Fred Schmit', 'Larry Tennis-nut', 'Sports Nut', 'Salesperson', 'Ms Gardiner', 'Section', 'Reporter', 'Editor', 'Chief Honcho', 'Joe Schmo', 'Mr. Science', 'Jane', 'Author', 'Person', 'Employee', 'Columnist', 'Manager', 'Director', 'Kim', and 'Kelly'. A highlighted arc connects 'Employee' to 'Manager' with the label 'From: Employee To: Manager Type: has subclass'. Below the graph, there are three panels: 'Nodes of Interest' (with 'Employee' selected), 'Arcs of Interest' (with 'has subclass' selected), and 'Neighbours' (with 'Outgoing and Incoming Arcs' selected). The 'Results' panel shows 'Performing Query...', 'Found 1 node.', and 'Found 23 neighbours Found 37 arcs.'.

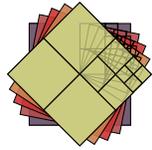
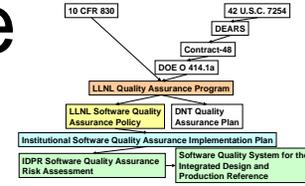
Web Services



A quality relationship



Consequence of failure is Tier 3/4

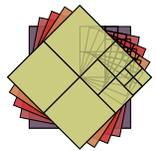


Banyan
Information Management System

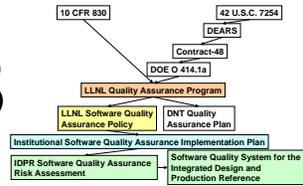
Annotated Risk Consequence Tiers from the Institutional Software Quality Assurance Implementation Plan

Consequence Tier	Risk Categories/Consequences			
	Environment, Health & Safety	Program, Cost & Schedule	Political & Public	Security
Tier 1	Catastrophe (multiple fatalities and serious injuries) Impact requiring immediate evacuation or other drastic action to protect public Felony or serious civil liability Significant hazard to public & employees Primary safety barrier	Major dollar loss, e.g. over \$1M Major schedule impact Failure to meet program requirements	Major loss of public confidence International adverse publicity	Release of classified or proprietary information Damage to or theft of physical or intellectual property
Tier 2	Serious OSHA/EPA violation or civil liability Hazard to employees Low hazard & primary safety barrier & simple software or high hazard for LLNL workers & secondary safety barrier & complex software Impact requiring action by offsite public	Minor cost impact, e.g. \$200K to \$1M Minor schedule impact Failure to meet program goals Potential LLNL operations work stoppage	Loss of public confidence National adverse publicity	Failure to account for classified or proprietary information Failure to account for physical or intellectual property
Tier 3	Minor OSHA/EPA violation or civil liability Accident possible, fatalities or serious injury unlikely Low hazard for LLNL workers Secondary safety barrier Impact requiring offsite cleanup, but no immediate effect on public	Acceptable cost impact, e.g. \$20K to \$200K Acceptable schedule impact Failure to meet <i>minor</i> program goals Potential project work stoppage or LLNL operations inconvenience	Minor public concern Adverse publicity within user community	Minor security concern
Tier 4	OSHA/EPA violation, civil liability unlikely Software does not control or mitigate a hazardous operation No offsite impact Negligible impact to LLNL Employees	Negligible cost impact, e.g. less than \$20K Negligible schedule impact Negligible program impact Potential for no more than a project inconvenience	Negligible public concern Adverse publicity within the Lab	No need for additional security beyond the norm

Table 4. Risk Consequence Tiers



Likelihood score is 3.875

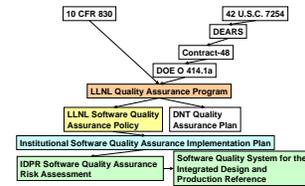


Annotated
Likelihood table
from the
Institutional
Software
Quality
Assurance
Implementation
Plan

Factors contributing to likelihood of software failure	Un-weighted likelihood of failure score					Weighting factor	Likelihood of failure ¹
	1	2	4	8	16		
Software Team Complexity	Up to 5 co-located people	Up to 10 co-located people	Up to 20 co-located people or 10 people with external support	Up to 50 co-located people or 20 people with external support	>50 co-located people or 20 people with external support	x2 1	2
Team Experience	12 or more years	6 years	3 years	1 year	4 months or less	x2 1	2
Contractor Support	None	Contractor with minor tasks		Contractor with major tasks	Contractor with major tasks critical to project success	x2 8	16
Organization Complexity ²	One location	Two locations but same reporting chain	Multiple locations but same reporting chain	Multiple providers with Prim/sub relationship	Multiple providers with associated relationship	x1 1	1
Schedule Pressure ³	No deadline		Deadline is negotiable		Non-negotiable deadline	x2 8	16
Process Maturity	CMM Level 4 – managed, optimizing	CMM Level 3 – defined processes	CMM Level 2 – repeatable processes	Record of repeated success	Little or no history	x2 8	16
Degree of Innovation	Proven and accepted		Proven but new to the development organization		Cutting edge	x1 1	1
Level of Integration	Simple – Standalone				Extensive Integration Required	x2 2	4
Requirement Maturity	Well defined objectives – No unknowns	Well defined – Few unknowns		Preliminary objectives	Changing, ambiguous, or untestable objectives	x2 1	2
Software Lines of Code ⁴	Less than 50K		Over 500K		Over 1000K	x2 1	2
Subtotal							62
							/16
Total							3.875

Table 5. Likelihood of Failures Due to Software Environment

The Risk Level is Low



Annotated Risk Level from the Institutional Software Quality Assurance Implementation Plan

Consequence of Failure Tiers					
Tier 1	Medium	High	High	High	
Tier 2	Low	Medium	Medium	High	
Tier 3	Negligible	Low	Low	Medium	
Tier 4	Negligible	Negligible	Negligible	Low	
		2	4	8	16
		Likelihood of Software Failure			

Table 2. Risk Level Assessment Grading

Practice 1 of 3

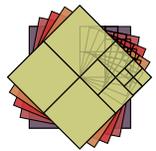
Practice	IDPR
Understand requirements to the extent known	The pilot and prototype systems were designed to elicit requirements.
Understand customer interactions	The pilot and prototype systems were designed to elicit an understanding of customer interactions.
Perform usability analysis as needed	The pilot and prototype systems were designed to analyze usability from the customer's point of view.
Determine applicable regulatory requirements	Possible Price-Anderson impact in the area of records retention. Implications are being investigated by A. Vinzant.
Understand software interfaces	Software interfaces have been identified.
Utilize coding standards	Specified in the software requirements document.
Select, train, and task team members	Zope training for all team members.
Identify, acquire, and deploy required resources	All open source software. Servers have been procured and workstations are procured as necessary.

Practice 2 of 3

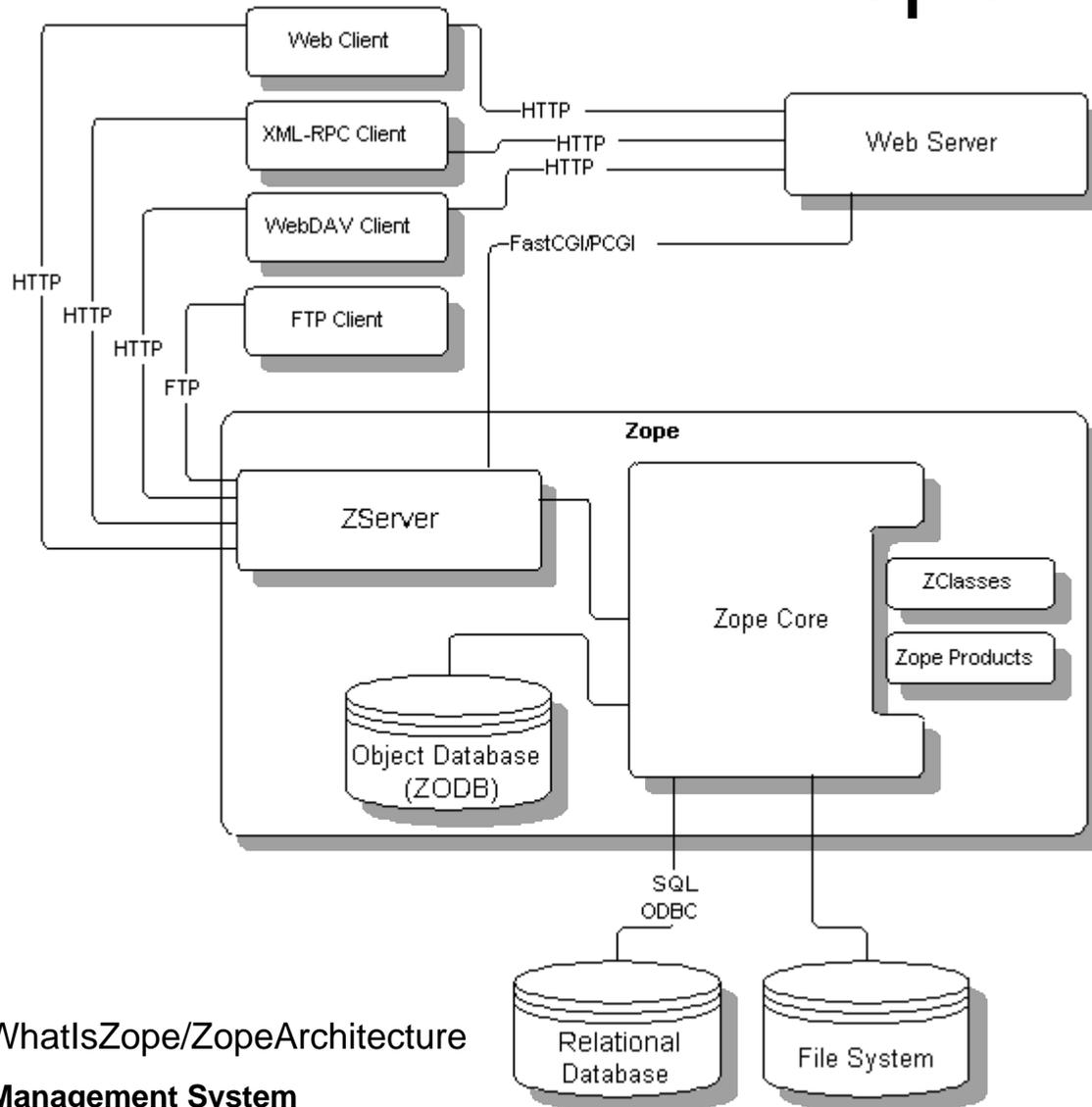
Practice	IDPR
Establish development and test environments	Two servers on the unclassified network will mirror servers on the classified network. Of the two servers, one is dedicated to production mirroring and one is dedicated to development mirroring.
Select software development methodology	Iterative development
Understand software design to the extent known	Yes
Understand software quality assurance	Yes
Understand risk analysis and mitigation	Yes
Understand software testing	Yes
Conduct walkthroughs	Close interaction with software developer will include walkthroughs at every milestone, as well as for the final product delivery.
Document subcontractor interfaces	Yes
Understand collaborations	Yes
Review and update requirements	Yes

Practice 3 of 3

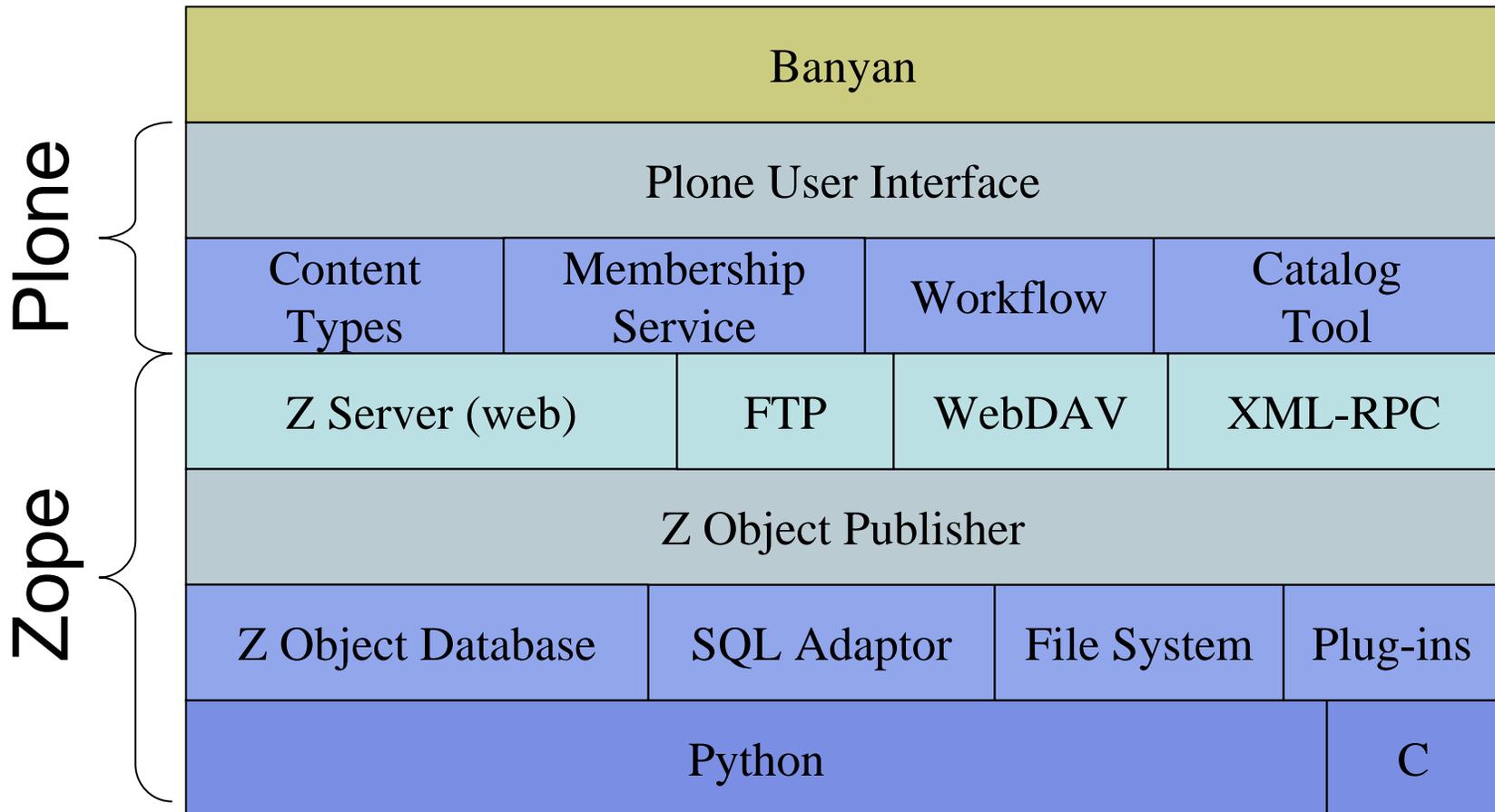
Practice	IDPR
Understand software configuration	Yes
Create informal disaster recovery strategy	Yes
Understand software integration	Yes
Conduct ad hoc acceptance testing	Yes
Understand feedback and status reporting	Yes
Provide maintenance support as needed	<p>IDPR is an ADAPT-funded project. ADAPT philosophy is to turn maintenance and operation of systems over to the Program upon completion. We are actively attempting to broaden the user community to assure a sustainable user base.</p>
Create release notes as needed	Yes



Banyan is based on Zope



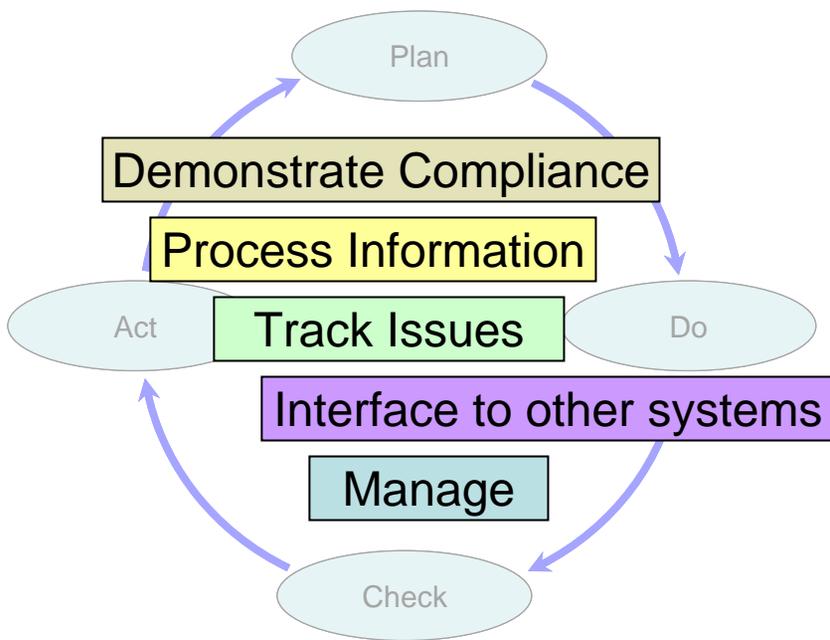
Zope/Plone/Banyan Stack



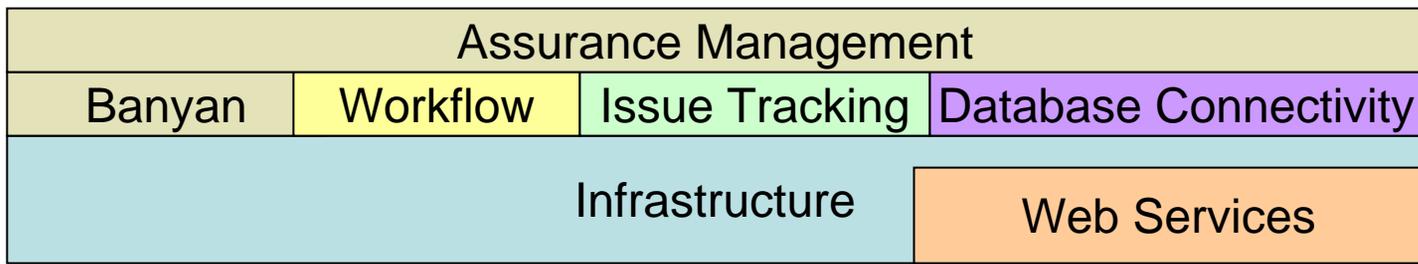
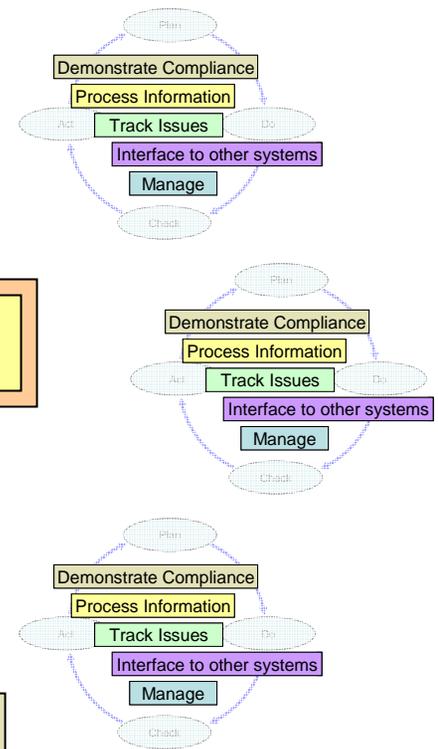
Important Attributes

- Web based, multi-user, collaborative tool
- Highly configurable
 - Applicable to a wide range of problem domains
- Integrative technology
- Scalable
- Affords layered visibility
 - **Rapid, hassle-free deployment**
 - **Incremental integration with other systems**

Banyan is part of a larger toolset



Distributed Workflow



Summary

- Proven track record
- Easily adapted
- Scaleable, integrative technology
- Easy to deploy and use
- Released as Open Source
- Looking for partners

The power of collaborative, clear thinking