Workflow Integrated Network Resource Orchestration
Agenda

> WS Workflows and Challenges
> WINNER
> Featured Solutions
> Related Work
> Summary
WS Workflows

> WS boosts up new opportunity of business development
  • Web Services (WS): service providers to customers
  • WS is interoperable and trustable among business partners
  • WS increases productivity by component service development and reduces cost by sharing services and avoiding function duplications
  • New opportunity for WS providers, publishers, applications and …
  • Globus is offering WSRF, as GT4 comes

> Workflow defines the automation of a business process
  • Streamlines the application job: WS and Grids
  • Evolves from object-oriented programming (OOP) to service-oriented architecture (SOA)
  • New support for WS: BPEL4WS, for Grid: GSFL

> Workflow has a bandwagon of applications
  • E-commercial: B2B, financial brokerage, travel planning
  • Enterprise: concurrent design, data center, human resources
  • E-Science: Grid computing, hi-energy computation
Challenges

> WS Workflows brings many new challenges
  • Business workflows streamline to network-wide collaboration
  • Grids/WS services and resources become workflow-aware

> Challenges on Network resources → our target
  • Pervasive resources share with service collaborations
  • Supply of services and resources may vary
  • Workflows may demand different levels of resources
  • Resource requirements move up or down as the workflow goes
WINNER

Workflow INtegrated NEtwork Resource orchestration

> Orchestrates network resources to serve workflows
  • Introduces new workflow process to applications
  • Provides workflow process services
  • Employs resource services to obtain network resources
  • Resource allocations and updates in time

> Extend the workflow arm of DRAC
  • DRAC is the Nortel product “Dynamic Resource Allocation Controller” in networks
  • WINNER is the workflow gateway between apps and DRAC

![Diagram](image-url)
WINNER Components

> WINNER Process
  • Defines the business activities specific on network resources
  • Is used by app, with associated business processes

> WINNER Process services
  • Realize the resource operations of the WINNER process
  • Support the workflow processing of network resources

> WINNER Resource services
  • Perform the allocation of network resources
  • Update the status of network resources
  • Work closely with DRAC
WINNER Process: activity samples

Interface to the Workflow Applications

> Application registration
  • Unique identification of each application
  • Classification of resource workflows

> Resource Job
  • Resource specification
  • Resource allocation
  • Resource re-allocation
  • Resource release

> Query
  • Network resources: available, status
  • Resource workflows
  • Resource negotiation, when applicable

> Misc
  • Account billing
  • Authorization, and security enhancement
DRAC: Dynamic Resource Allocation Controller

WINNER is the Workflow Arm of DRAC

> Resource discovery
  - Available physical resources in network domains
  - Available network services in network domains
  - Resource property, status and updates

> Resource Utilization
  - Resource reservation and scheduling
  - Resource allocation and release
  - Job status and feedback

> Resource management
  - Resource collection and abstraction
  - Network configuration and control
  - Security and AAA

> Application-aware smarts on resources
  - Multiple API gateways: Grid, workflow, storage
  - Resource policy, SLA
  - Resource optimization
  - Resource monitor and performance
WINNER and Grids Workflows

> WINNER supports Grid apps with Grid workflow engine
  - WINNER Process provides the workflow interface to Grids apps
  - WINNER service (PS) provides workflow processing of network resources
  - WINNER service (RS) works with the DRAC Grid (GPAN) to perform network resource allocations in the Grid domains
WS Workflow applications take advantages of Grids

- WS engine provides the WINNER process to WS apps
- Grids engine provides Grids services to WS app through WINNER services
WINNER and Multiple Workflows

> Web Services are re-utilized across multiple types of workflows
  • GT4: WSRF
  • BPEL4WS
  • Apache WS

> WINNER support respective workflow service engines
  • WINNER services widely shared
WINNER and Late-Binding

- Late binding resources with workflows happen when
  - Workflow services and/or resources supply change
  - Workflows compete or optimize for resources
  - Workflows have special or uncertain requirements of resources

- WINNER performs workflow-aware late-binding, through DRC
  - Network resources selections or alternations according to applications
  - Resource optimization such as switching among workflows
  - Service site selections or alternations, together with service providers

- Typical usecases
  - Workflow Engaged Networks for Radiology in Metro Regions
  - Disaster Data Evacuation workflow (see below)
Related Work

> BPEL4WS

> GridFlow: the SDRC Matrix
  • http://www.npaci.edu/dice/srb/matrix/

> GSFL and GridAnt
  • http://www-unix.globus.org/cog/projects/workflow/

> Pegasus and vGRADS
  • http://www.globus.org/about/events/sc2004/demos.html

> GWFE
  • http://www.gridbus.org/workflow/
Summary

> WINNER integrates network resources with WS workflows
  • Provides WINNER processes, process services and resource services
  • Workflow-aware network resource allocations

> DRAC network services are leveraged for allocation and information on network resource orchestration

> Late-binding gives the capability to supply network resources in favor of application workflows

> WINNER fits with Grids, Web Services, and other workflow applications
  • WS workflows can take advantages of Grids
Workflow Integrated Network Resource Orchestration

Questions and Comments?