

Investigating Service Oriented Architecture (SOA)

University of Washington 2.0



Information Futures: *Aligning Our Missions*

Who are we?

- Tony Chang, Computing and Communications
- Erik Lundberg, Computer Science and Engineering
- Todd Mildon, Office of the Registrar
- Scott Stephenson, Office of Information Management



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Who do we represent?

Central
Administration

OIM

C&C

Academic
Units



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University of Washington

- Public research university
- Three campuses: Seattle, Tacoma, Bothell
- 17 schools and colleges, quarter system
- 41,000 students
- 23,500 faculty & staff
- #1 public institutional recipient of Federal R&D \$\$
- Two medical centers and a medical school
- Biennial operating budget: \$2B (11% state)



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UW Vision & Values

- www.washington.edu/discovery/
- Uniquely Washington
- **Discovery** is at the heart of our university
- We discover timely solutions to the world's most complex problems and enrich the lives of people throughout our community, the state of Washington, the nation, and the world
- integrity ~ diversity ~ excellence ~ **collaboration** ~ **innovation** ~ respect



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UW Vision & Values

- Standards of **Excellence**
 - best, most diverse, and **innovative** faculty and staff
- World Leaders In Research
 - culture of **innovation** and **collaboration**
- Spirit of Innovation
 - determined persistence that engenders **innovation**
 - belief that our goals can be realized
- World Citizens
 - active pursuit of **global** engagement and **connectedness**
- Being Public
 - serving all our citizens
 - **collaborate** with **partners** from around the **world**



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Computing Environment

- Central administrative applications (finance, payroll, HR, etc.) on Unisys mainframe; no ERP
- Many admin. Web applications front-end the mainframe apps
- Heterogeneous technologies
 - Environments/Languages: Mainframe, .NET, J2EE, Perl, PHP, Ruby, Python, ...
 - OSs: MCP, Windows, Unix (various flavors)
 - DBs: DMS II, SQL Server, Informix, Oracle, MySQL, PostgreSQL



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Computing Environment

- Infrastructure services: WebLogin, Shibboleth (authn); ASTRA (authz); Person Directory
- Lots of development happening in academic units
- Local shadow systems: lots and lots of data duplication
- Mainframe is only real-time central data store; ODS for analytics; growing EDW



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The Evolving Environment



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Broad Conceptual Shifts

- **Past:** everyone else was “them”; lots of complaining; applications delivered by central IT often didn’t meet local needs
- **Present:** trying to understand local wants/needs to deliver the right application
- **Future:** partnership and collaboration; local groups take part in building things



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Broad Cultural Shifts

- New perspectives on technology & information
- Central IT's glasnost: customer focus
- From consumers to technologists: can see how things might be different (Web 2.0, open-source, crowd-ware, etc.)
- Start feeling like partners instead of clients



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Information is an Asset

- Squander it or steward it
- The Great Starvation: central IT can't possibly keep up with demand
- Uniquely, the more it's available, the more valuable it is
- Availability enables innovation
- "Free the data": move from "who you know" data surface to a role-based, flexibly presented one
- Common data definitions are key! (Data Management Committee)



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Codified Business Process is an Asset

- Squander it or steward it
- Tied up in tightly-coupled, opaque legacy systems with proprietary, closed interfaces: poor business agility
- “Free the processes”
- Move to loosely-coupled, transparent systems
- Requires common data definitions



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The Time is Ripe for SOA



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Reached a Crossroads

- Release of the “Future of Information Systems Task Force” final report
- Computing and Communications (IT) strategic planning and restructuring efforts
- Creation of the new Office of Information Management
- Commitment from high-up for change



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IS Futures Report Recommendations

- Create a well-defined organizational structure
- Develop a clearly defined, coordinated IT strategy
- Create a culture of awareness across the University community
- Create a system of regularly updating and improving IT
- Move ahead aggressively with the Data Warehouse to support administrative goals
- Make use of innovation and integration to develop new solutions
- Evaluate lifespan of the legacy systems and plan accordingly
- “It’s not about technology, it’s about business practices”



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Office of Information Management

- Created in late 2006
- Vice Provost-IM/CIO Sara Gomez
- Mission is to “direct information management and information systems throughout the University of Washington”
- Four Divisions
 - Business Applications
 - Community and Partnership Development
 - Enterprise Information Services
 - Strategic Projects and Portfolio Management



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Enabling the UW Mission

- Excellence
- Innovation
- Discovery
- Partnership
- Collaboration
- Global connectedness
- Serve citizens



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The Vision

- Free the data; free the processes; free the academic units
- Put business (academic units) in the driver's seat
- Business agility is key
- Be an information provider to the world (and internally)



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Why SOA?

- Looks like the Web
 - Network addressable
 - Pervasive and ubiquitous
 - Open and interoperable
 - Adaptable/evolvable
 - Enables loosely-coupled systems
- Pushes app. dev. to the “edge” (composite apps/mashups): those who know best



Why SOA?

- Stop redundancy (data, systems & services)
- Replacing the legacy administrative systems
 - Demand for loose coupling / abstraction
 - Evolution not revolution
- Agent for cultural change
 - Requires partnership and collaboration
 - All about culture (not technology)
- Another assault on mythical reuse



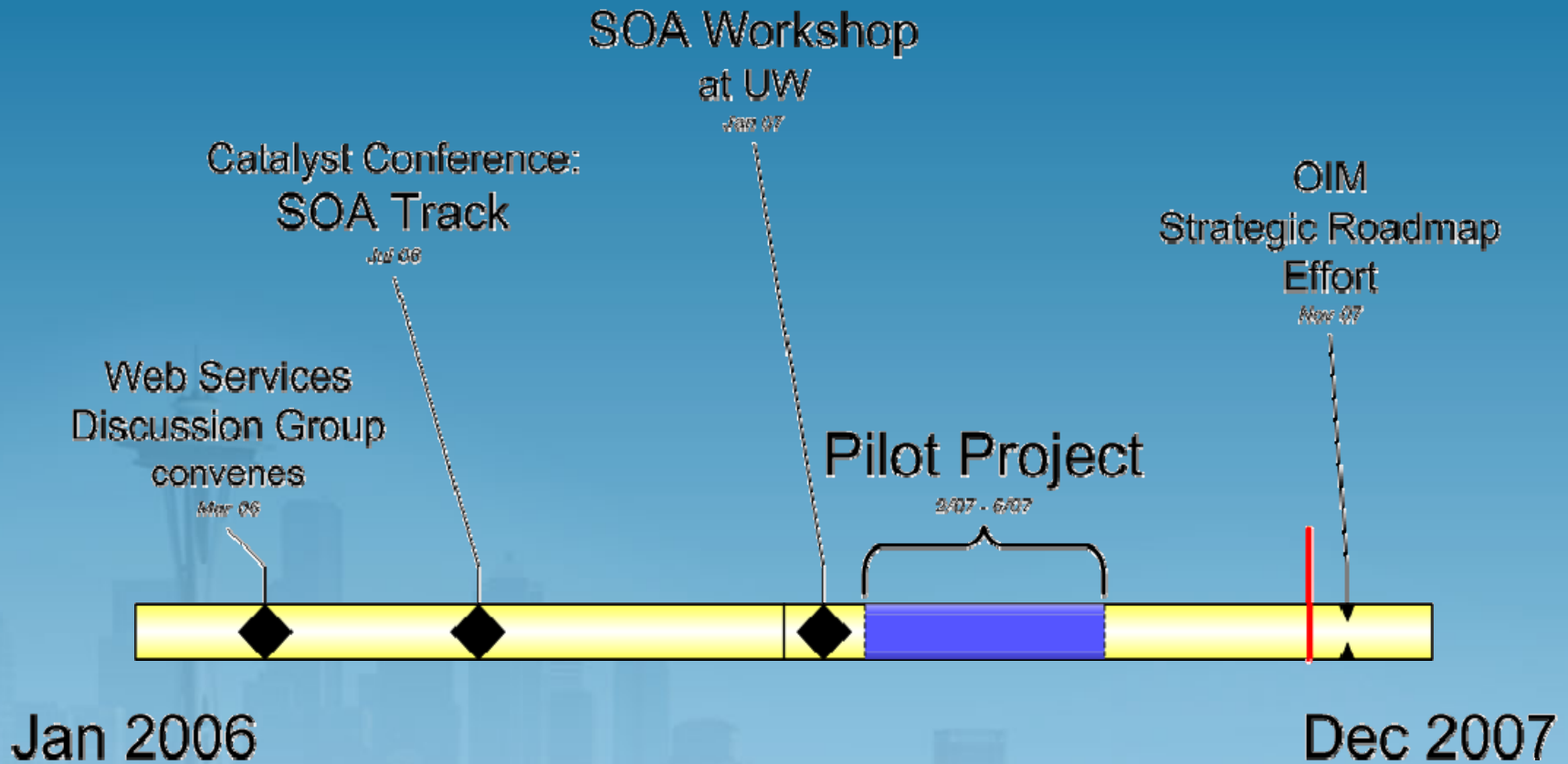
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Exploring SOA



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The Journey



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SOA Pilot Project Goals

- Demonstrate unassailable business value
- Solve some existing problem
- Simple, but useful
- Non-sensitive data (*defer auth to keep it simple*)
- Provide a good discovery vehicle (*WS, SOA ...*)
- High chance of success



Why the Time Schedule?

- Centrally-held data that many units need
- Relatively "simple" data (in size and structure)
- Fairly easy for central data providers to dip their toes into the SOA waters
- Fairly easy for campus data consumers to dip their toes into the SOA waters



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Why the Time Schedule?

(cont.)

- Non-sensitive (public) data, so avoids the complexity of authentication and authorization
- Easy to steer clear of mission-critical usage, so changes would not present major difficulties for participants
- Easy to expand participation in a controlled way



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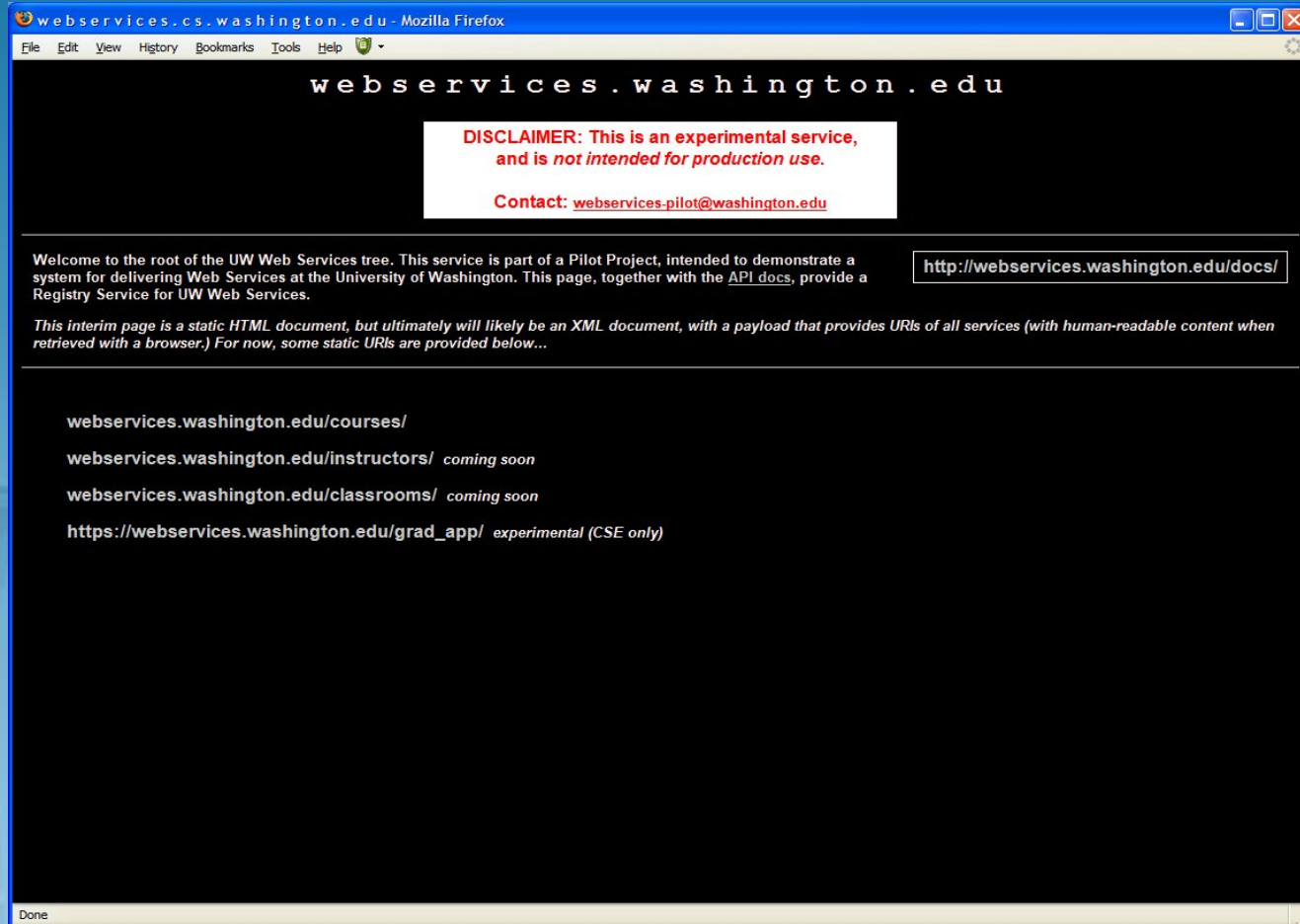
Courses

- Single place for everything: webservices.washington.edu
- The Service:/courses
- The API:/docs/courses
- Code Library:/docs/courses/code
- Together: a Registry
- REST v. SOAP
- This is not SOA, but a vehicle for exploring it



One Place for All Services

webservices.washington.edu



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The API

webservices.washington.edu/docs

The screenshot shows a Mozilla Firefox browser window displaying the website webservices.washington.edu/docs/. The page title is "webservices.washington.edu/docs/" and the URL bar shows the same. The page content includes a navigation menu on the left with links for "Course Schedule Data", "Grad School Applicants", and "Other Web Services". The main content area is titled "API information for UW Web Services - ALPHA VERSION" and is organized into sections: "Web Service APIs", "Course 'Time Schedule' Data Services - ALPHA VERSION", "Graduate School Applicants Service - EXPERIMENTAL", and "Other Web Services". Under "Other Web Services", there are sub-sections for "REST" and "SOAP". The "REST" section lists "URI ? Graduate Admissions application for 2008 webservises" and "URI ? Catalyst Group Manager". The "SOAP" section lists "Astra UW's authorization management service - Astra WSDL" and "ITS Intelligent Transportation Systems Web Services allow programs to interact with data servers and to retrieve content in a platform-independent manner. The ITS Web Services server is based on the Microsoft .NET framework. They publish the ITS WSDL." At the bottom of the page, there is a "DRAFT" notice dated "13 June 2007" and a "Done" status bar.

webservices.washington.edu/docs/ - Mozilla Firefox

File Edit View History Bookmarks Tools Help

webservices.washington.edu/docs/ UW Web Services Root

API information for UW Web Services - ALPHA VERSION Info for Service Developers

Web Service APIs

- Course Schedule Data
- Grad School Applicants
- Other Web Services

Course "Time Schedule" Data Services - ALPHA VERSION

- webservices.washington.edu/docs/courses/ Courses API (*working document*) - ALPHA
Information about course offerings at all UW campuses.
- webservices.washington.edu/docs/instructors/ Instructors API (*coming soon*)
Information about instructors at all UW campuses.
- webservices.washington.edu/docs/classrooms/ Classrooms API (*coming soon*)
Information about classrooms and courses scheduled in them, at all UW campuses.

Graduate School Applicants Service - EXPERIMENTAL

- webservices.washington.edu/docs/grad_app/ grad_app API (*working document*) - EXPERIMENTAL
Information about applicants to UW Graduate School.

Other Web Services

REST

- [URI ?](#) Graduate Admissions application for 2008 webservises
- [URI ?](#) Catalyst Group Manager
This pilot project allows you to create and manage groups of users who can access your Catalyst Tools. Using this standalone pilot version of Catalyst Group Manager, you can create and manage groups that are automatically published to the UW Groups Directory Service and UW Windows Infrastructure, where they can be reused to control access to other kinds of resources.

SOAP

- [Astra](#) UW's authorization management service - Astra WSDL
- [ITS](#) Intelligent Transportation Systems Web Services allow programs to interact with data servers and to retrieve content in a platform-independent manner. The ITS Web Services server is based on the Microsoft .NET framework. They publish the ITS WSDL.

DRAFT
13 June 2007

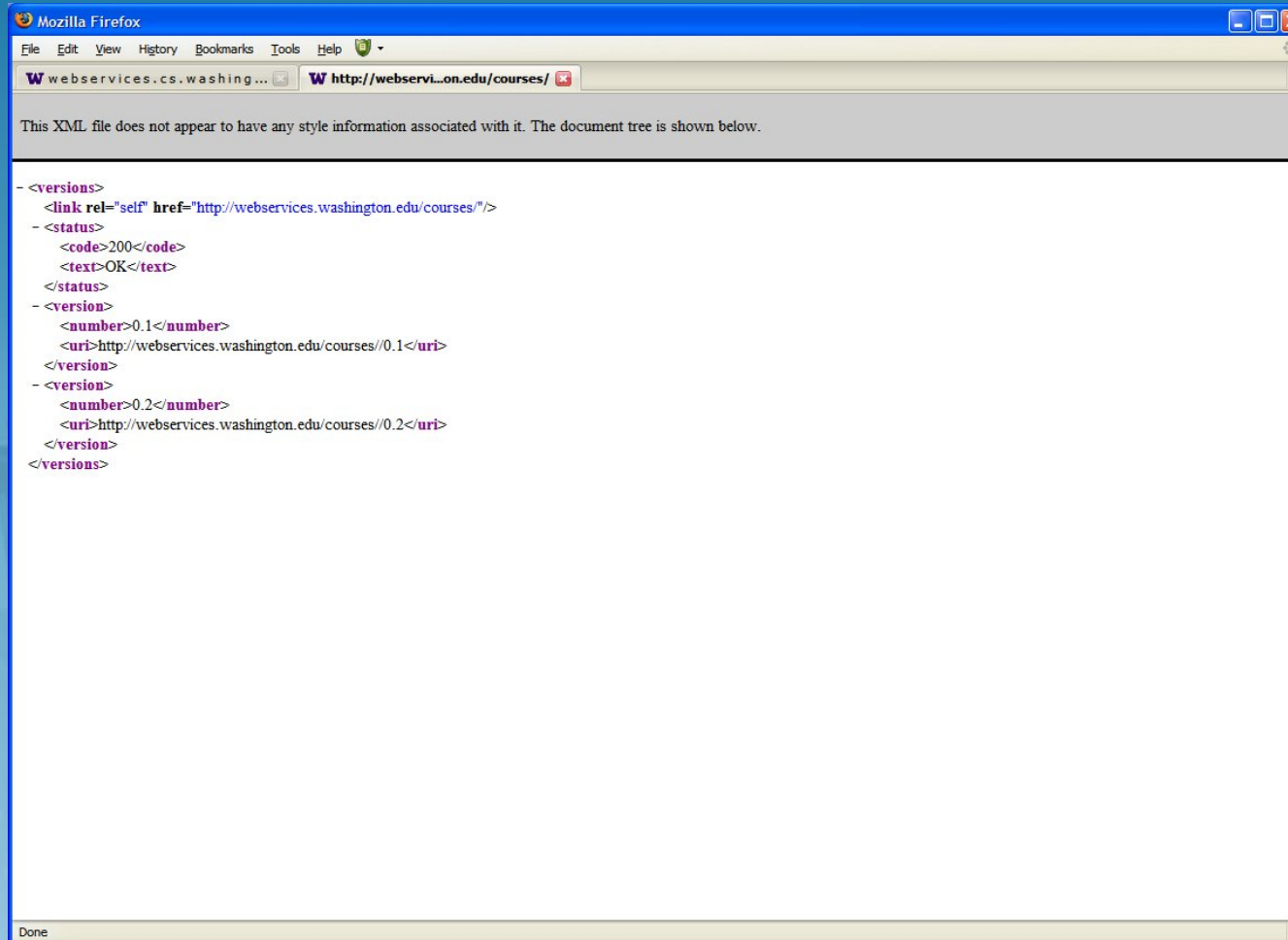
Done



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The Service

webservices.washington.edu/COURSES



Mozilla Firefox

File Edit View History Bookmarks Tools Help

W webservices.cs.washing... W http://webservi...on.edu/courses/

This XML file does not appear to have any style information associated with it. The document tree is shown below.

```
- <versions>
  <link rel="self" href="http://webservices.washington.edu/courses/">
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  <code>200</code>
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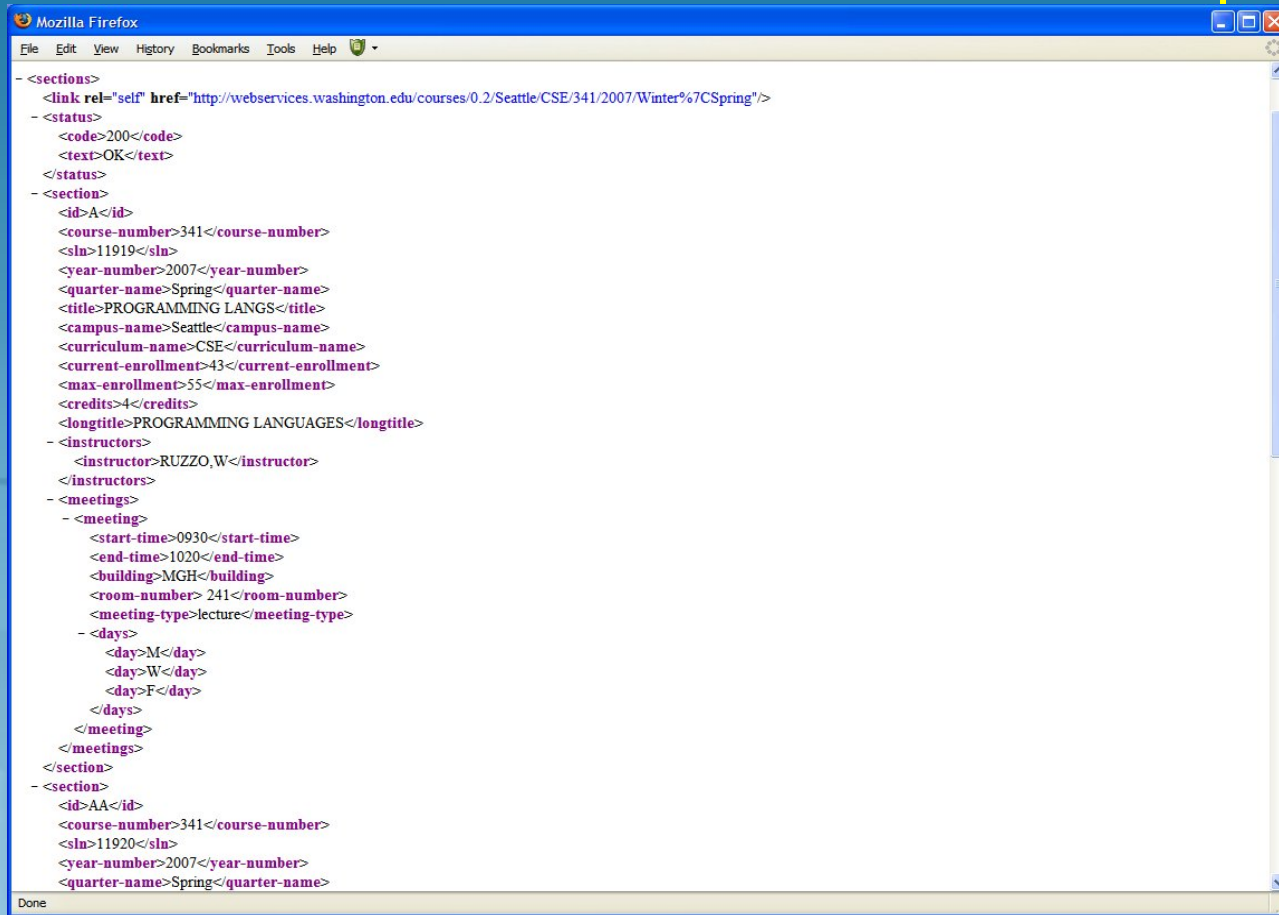
Done



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The Payload

webservices.washington.edu/courses/
0.2/Seattle/CSE/341/2007/Winter|Spring



The screenshot shows a Mozilla Firefox browser window with the address bar containing the URL: `http://webservices.washington.edu/courses/0.2/Seattle/CSE/341/2007/Winter%7CSpring/`. The main content area displays XML code with the following structure:

```
- <sections>
  <link rel="self" href="http://webservices.washington.edu/courses/0.2/Seattle/CSE/341/2007/Winter%7CSpring"/>
  - <status>
    <code>200</code>
    <text>OK</text>
  </status>
  - <section>
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    <sln>11919</sln>
    <year-number>2007</year-number>
    <quarter-name>Spring</quarter-name>
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    <curriculum-name>CSE</curriculum-name>
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    <max-enrollment>55</max-enrollment>
    <credits>4</credits>
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          <day>W</day>
          <day>F</day>
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      </meeting>
    </meetings>
  </section>
  - <section>
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    <course-number>341</course-number>
    <sln>11920</sln>
    <year-number>2007</year-number>
    <quarter-name>Spring</quarter-name>
```



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A Business Use

College of Education - University of Washington - Mozilla Firefox

File Edit View History Bookmarks Tools Help

home directory calendar contact intranet UW site map search:

[About the College](#)
[Academics](#)
[Faculty & Research](#)
[Students](#)
[Admissions](#)
[Alumni & Friends](#)
[News & Events](#)
[Resources](#)

Photo of Miller Hall
Looking up from the western steps

College of Education
University of Washington
Box 353600
Seattle, WA
98195-3600

Dean's Office:
206-616-4805

Office of Student Services:
206-543-7834
(admissions and general information)

EDTEP courses for Autumn, 2007

| | | |
|--|---|-----------------------------------|
| EDTEP 503A MW: 1130-1220 | THIRD QUARTER FIELD EXPERIENCE - ELEMENTARY | GORDON,C HARRIS,K PECK,C |
| EDTEP 503B MW: 1130-1220 | THIRD QUARTER FIELD EXPERIENCE - ELEMENTARY | MICROULIS,Z HARRIS,K PECK,C |
| EDTEP 522A TR: 0930-1120 | TEACHING AND LEARNING IN NUMERACY II | BALF,R |
| EDTEP 523A MW: 0930-1120 | TEACHING AND LEARNING IN SCIENCE | THOMPSON,J |
| EDTEP 533A TR: 0100-250 | TEACHING AND LEARNING LITERACY III | REECE,A |
| EDTEP 551A T: 0830-1120 | MULTICULTURAL TEACHING | MICROULIS,Z |
| EDTEP 551B W: 0830-1120 | MULTICULTURAL TEACHING | AOKI,E |
| EDTEP 561A MW: 0830-1020 MW: 1030-1120 | DILEMMAS OF TEACHING AND LEARNING | STEVENS,R STEVENS,R |
| EDTEP 561B TR: 0830-1020 TR: 1030-1120 | DILEMMAS OF TEACHING AND LEARNING | NOLEN,S NOLEN,S |
| EDTEP 580A MW: 0100-250 | TEACHING ENGL & LANG ARTS IN SECONDARY SCHOOL I | MIKOLASY,K |
| EDTEP 582A M: 0130-420 T: 0100-350 | TEACHING MATHEMATICS IN THE SECONDARY SCHOOL I | CAMPBELL,S |
| EDTEP 584A TR: 0100-250 | TEACHING SOCIAL STUDIES IN THE SECONDARY SCHOOL I | PARKER,W PARKER,W |

Done



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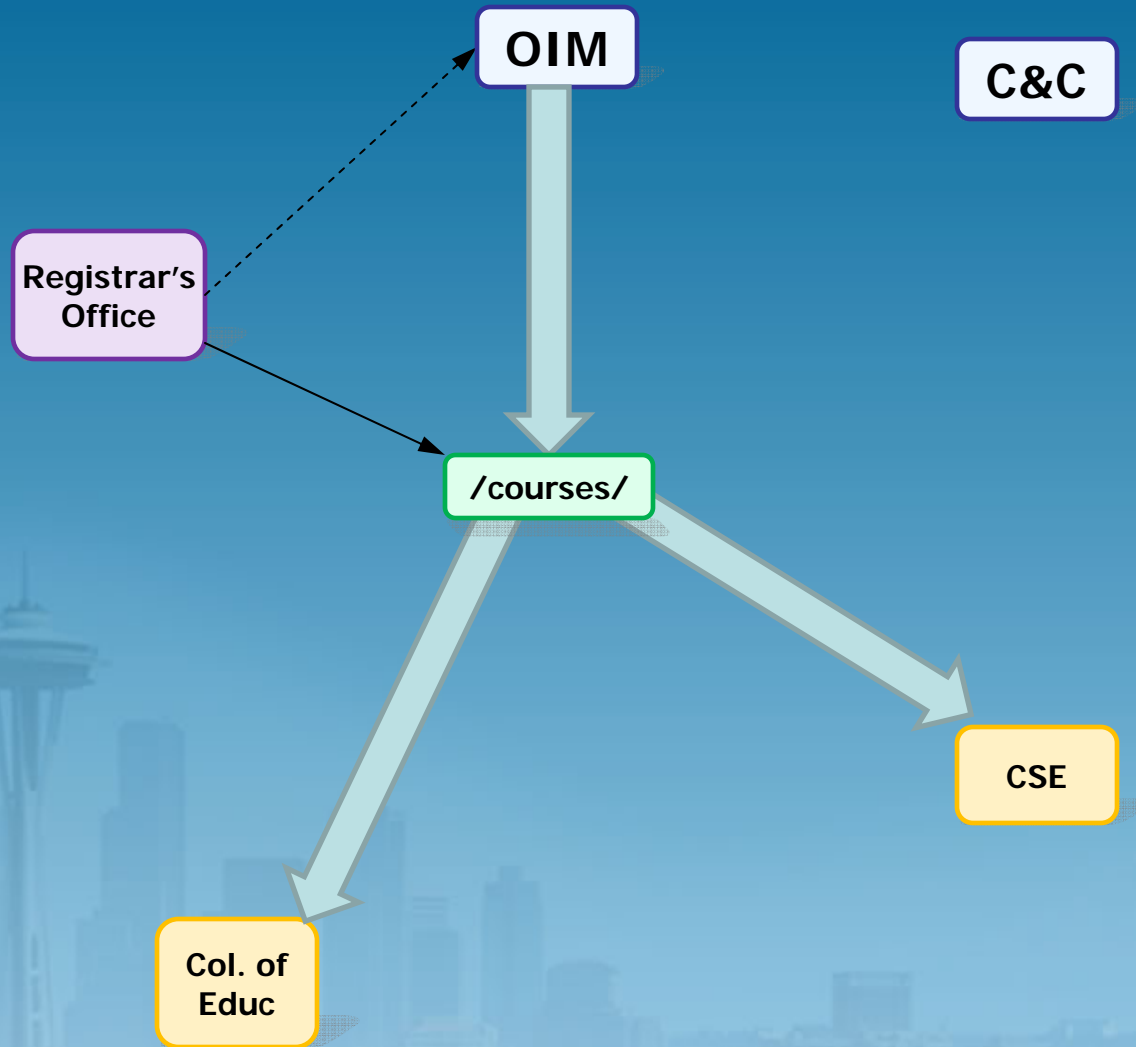
Collaboration Story

- Partnership involving all four areas...
 - OIM
 - C&C - Emerging Tech & Catalyst
 - Business Process Owner - Registrar's Office
 - Depts & Colleges - CSE & College of Education



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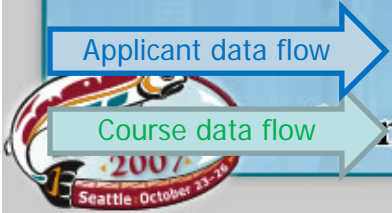
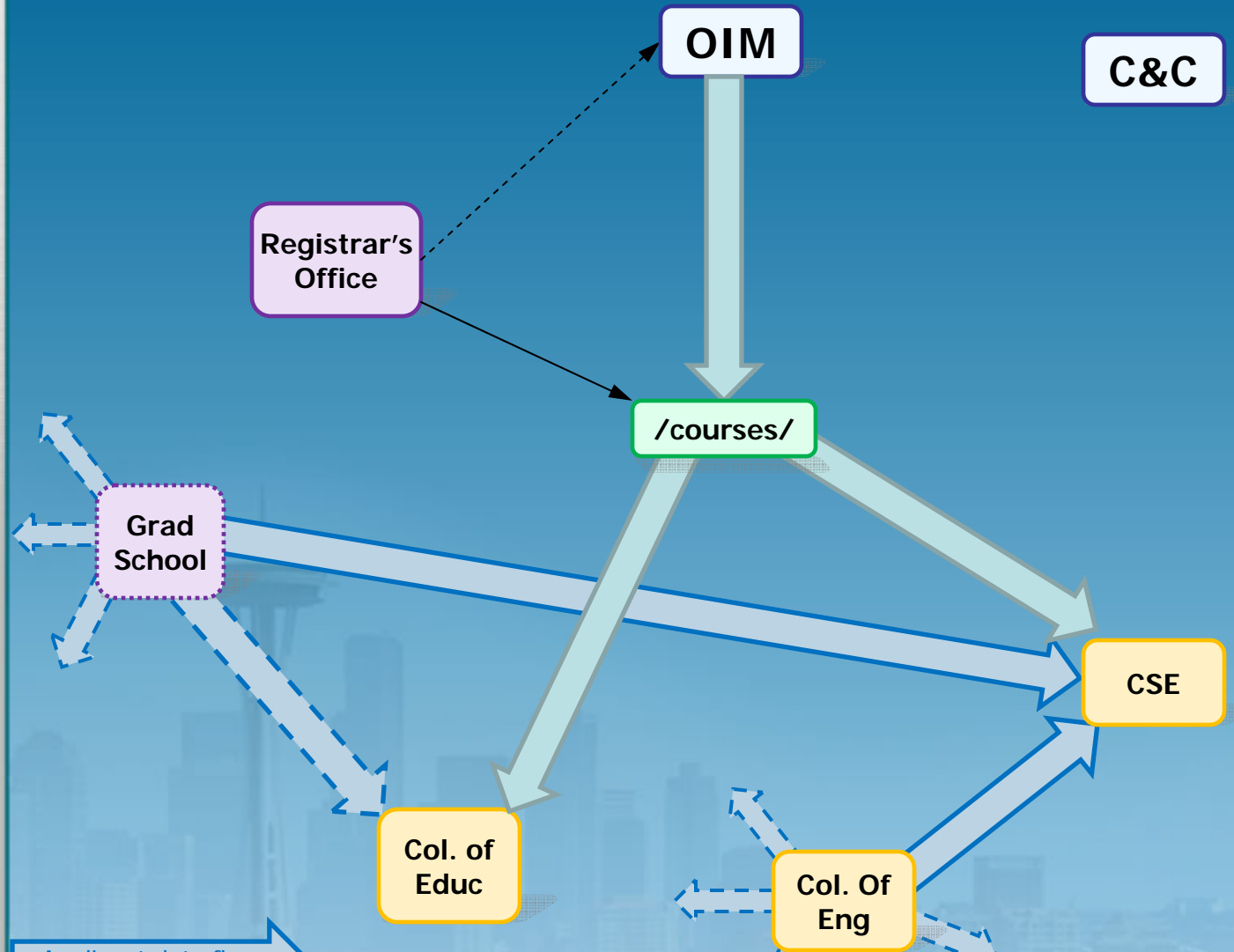
The Emerging UW SOA Landscape



Course data flow

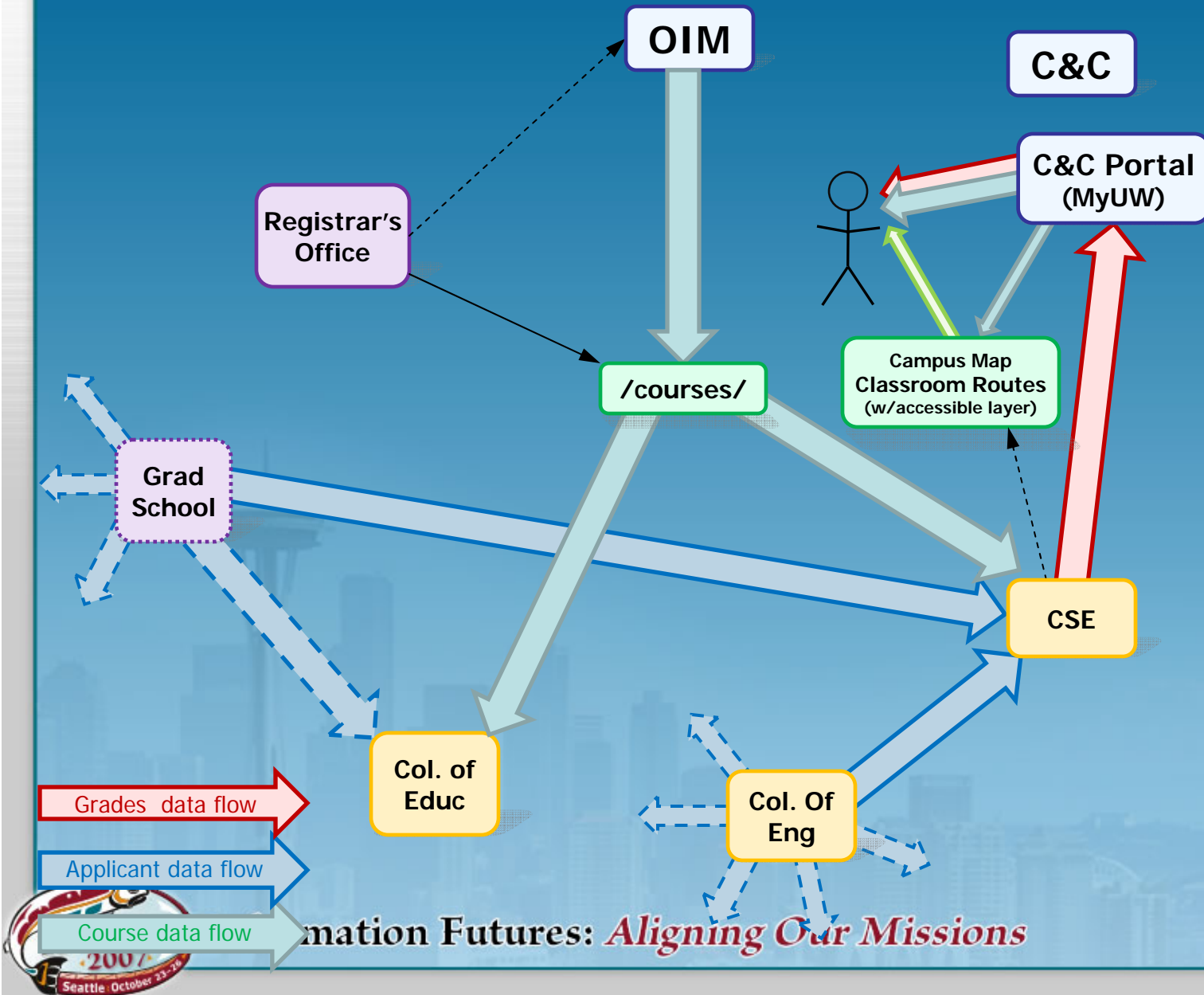
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The Emerging UW SOA Landscape

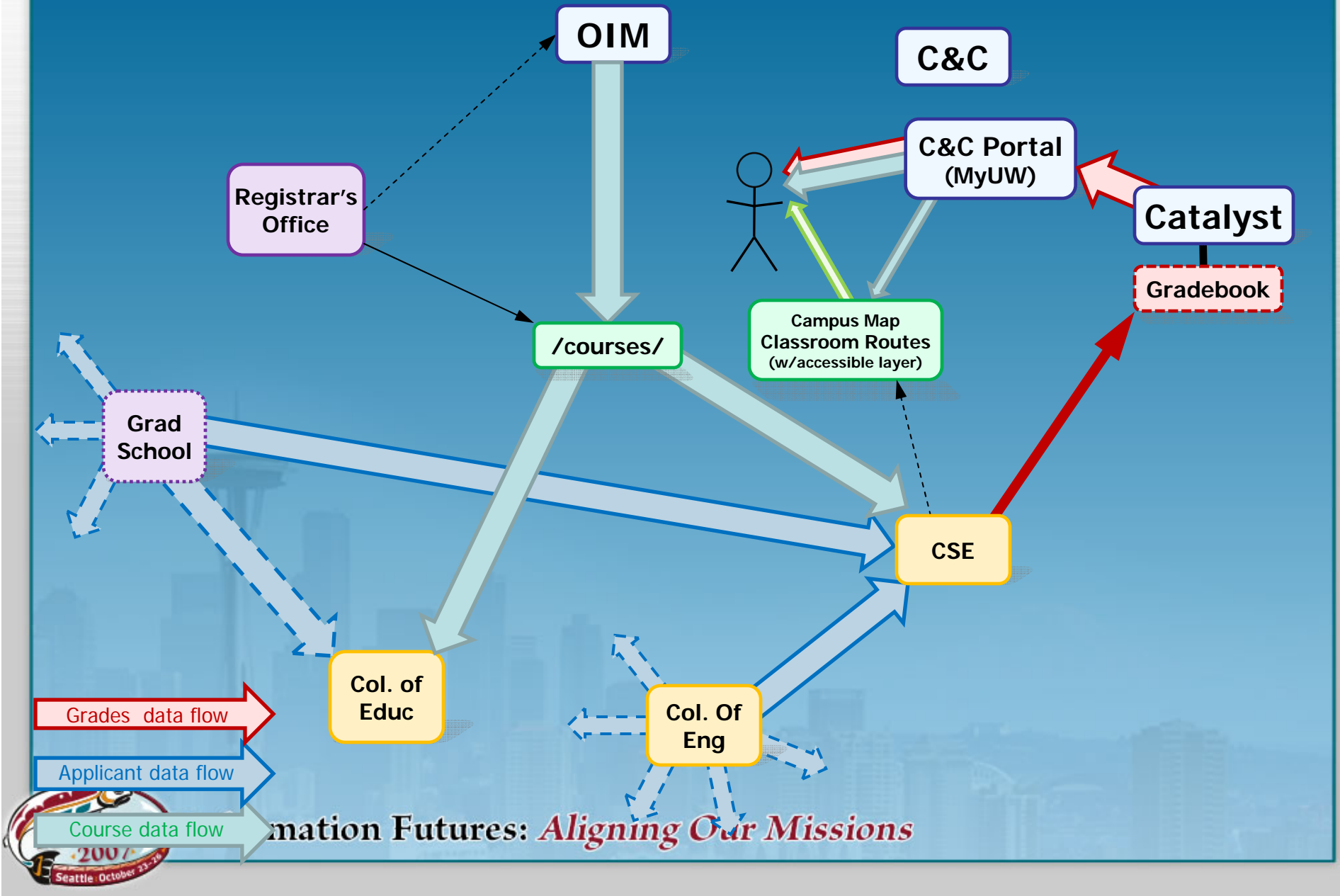


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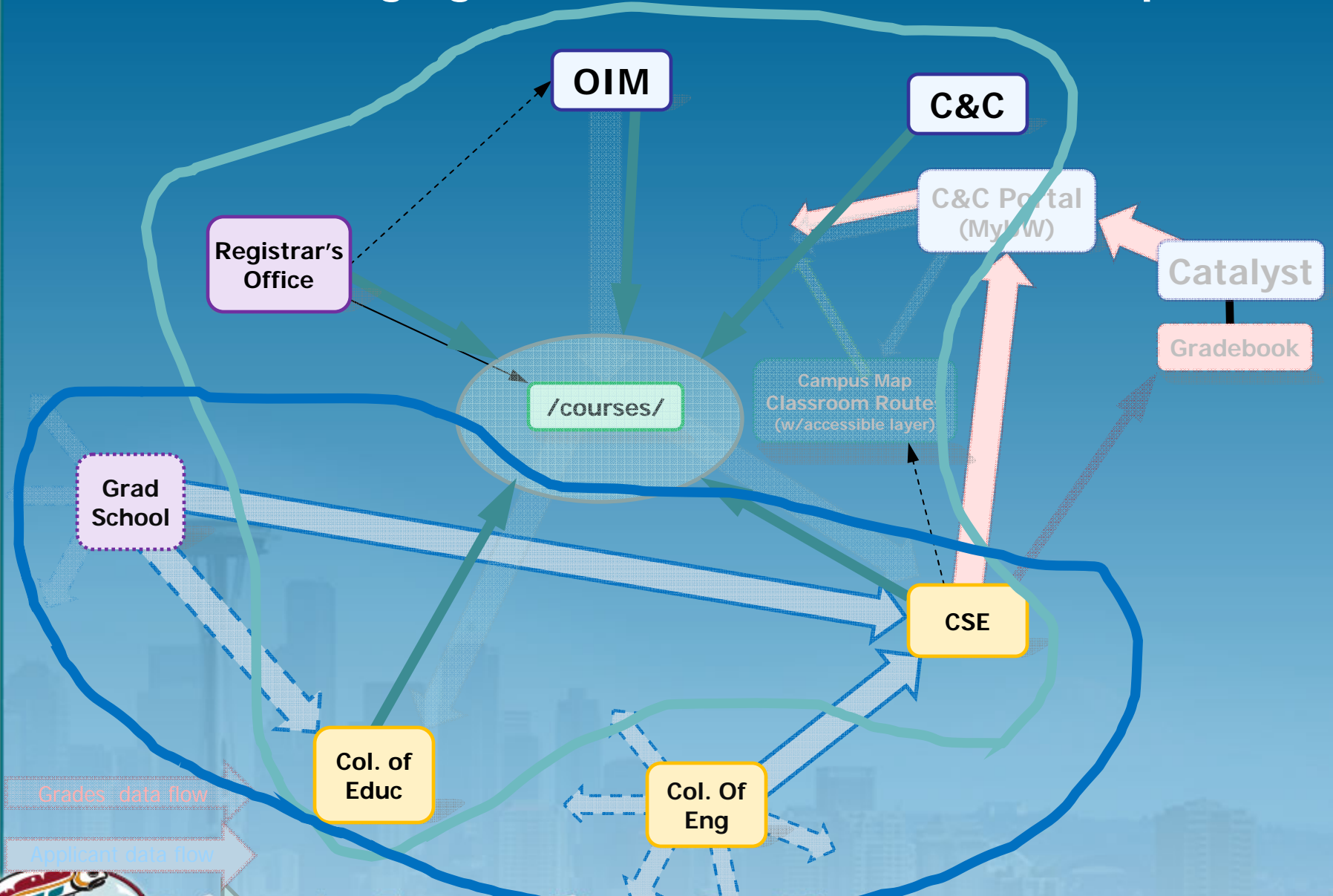
The Emerging UW SOA Landscape



The Emerging UW SOA Landscape



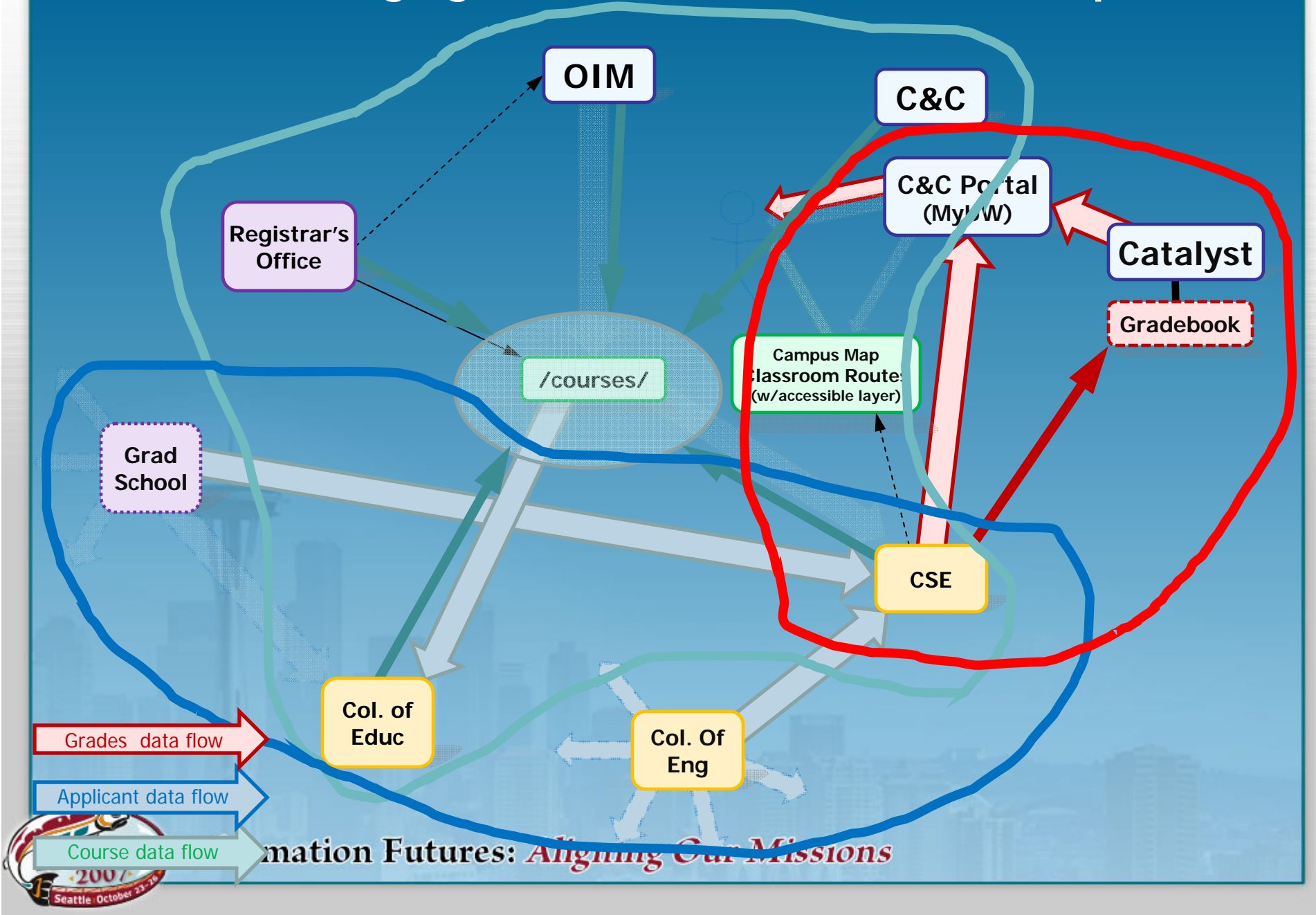
The Emerging UW *Collaboration* Landscape



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The Emerging UW *Collaboration* Landscape



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Discoveries

a reflection on our journey



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Challenges

- New design methods – REST & ATOM
- Transforming known structured data to XML & JSON
- Building the right security model
- What does SOA mean to us?
- Moving from Micro to Macro



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More Challenges

- Independence; uncoordinated diverse development
- Staff and systems are siloed
 - Redundant systems
 - Resist change
 - Limited “big picture” visibility
 - How to embrace change?
- Systems are tightly coupled



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Yet More Challenges

- Some business process owners don't want to take part
- Be agile while still respecting schedules and priorities
- Become less risk averse while still being secure
- Few incentives for developing shared services
 - Cost, support burden, etc.
- What does SOA Governance mean to us? How do we agree on it?



Key Learning

- Being a good service-oriented citizen
- Build new collaborative relationships
- Leverage skills outside of your immediate group
- Develop in manageable chunks
- We chose REST
- Utilize what's already out there



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More Key Learning

- A central registry for services and documentation
- Encourage and reward innovative thinking and action
- Identify agents for change in the organization
- Identify stakeholders early
- Build a strong relationship with the business owner



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Collaboration Success

- A model for effective working relationships
- Agile Development
- Opening new communication channels
- It's Fun!



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It's not a club!

- Shared vision among all of us, not just we four
- Not a completed vision
- We all have opportunities
- We are all empowered to make things different
- Bottom line: this is just a beginning; we need to evolve it together



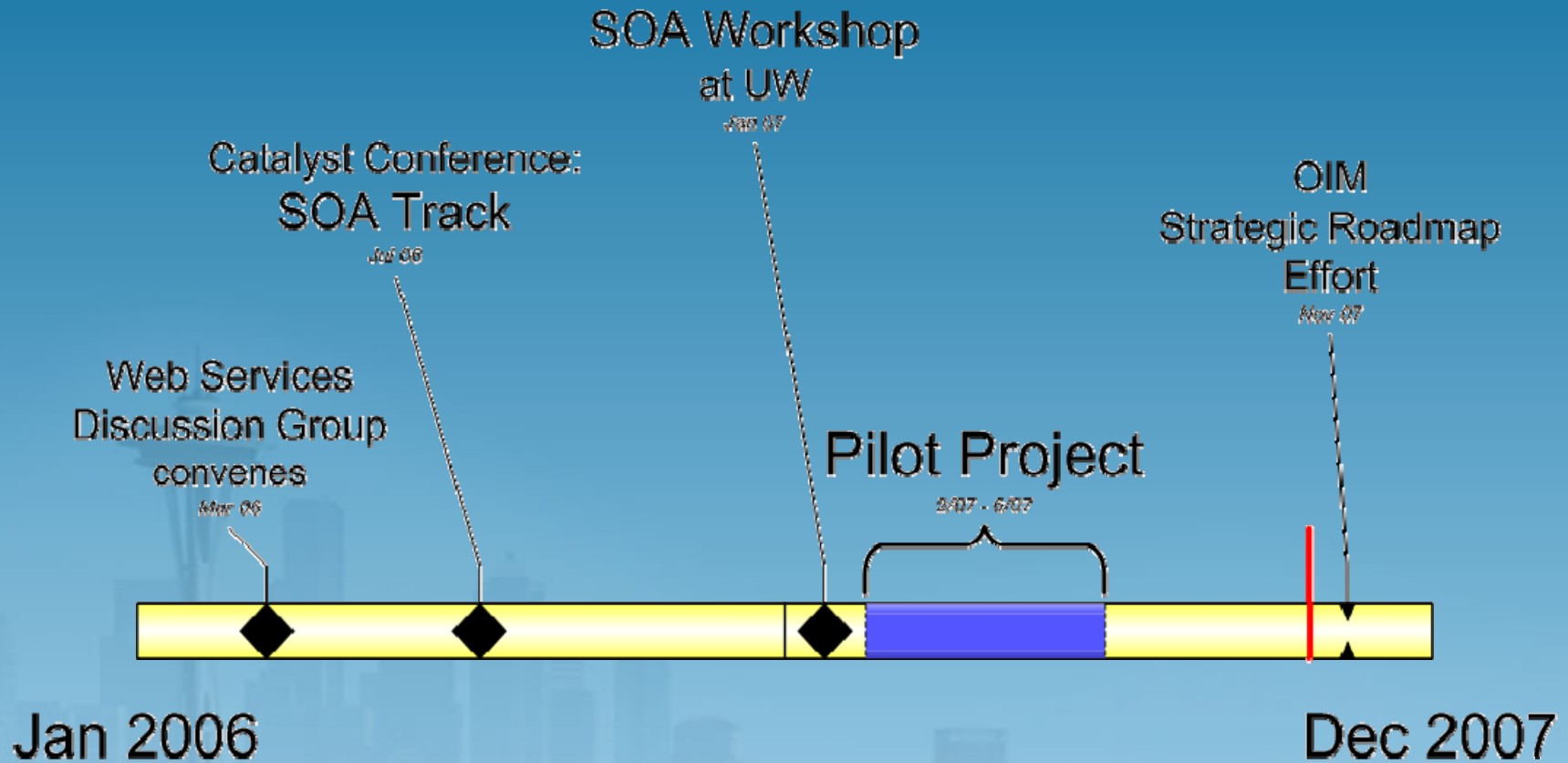
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Moving Beyond the Pilot



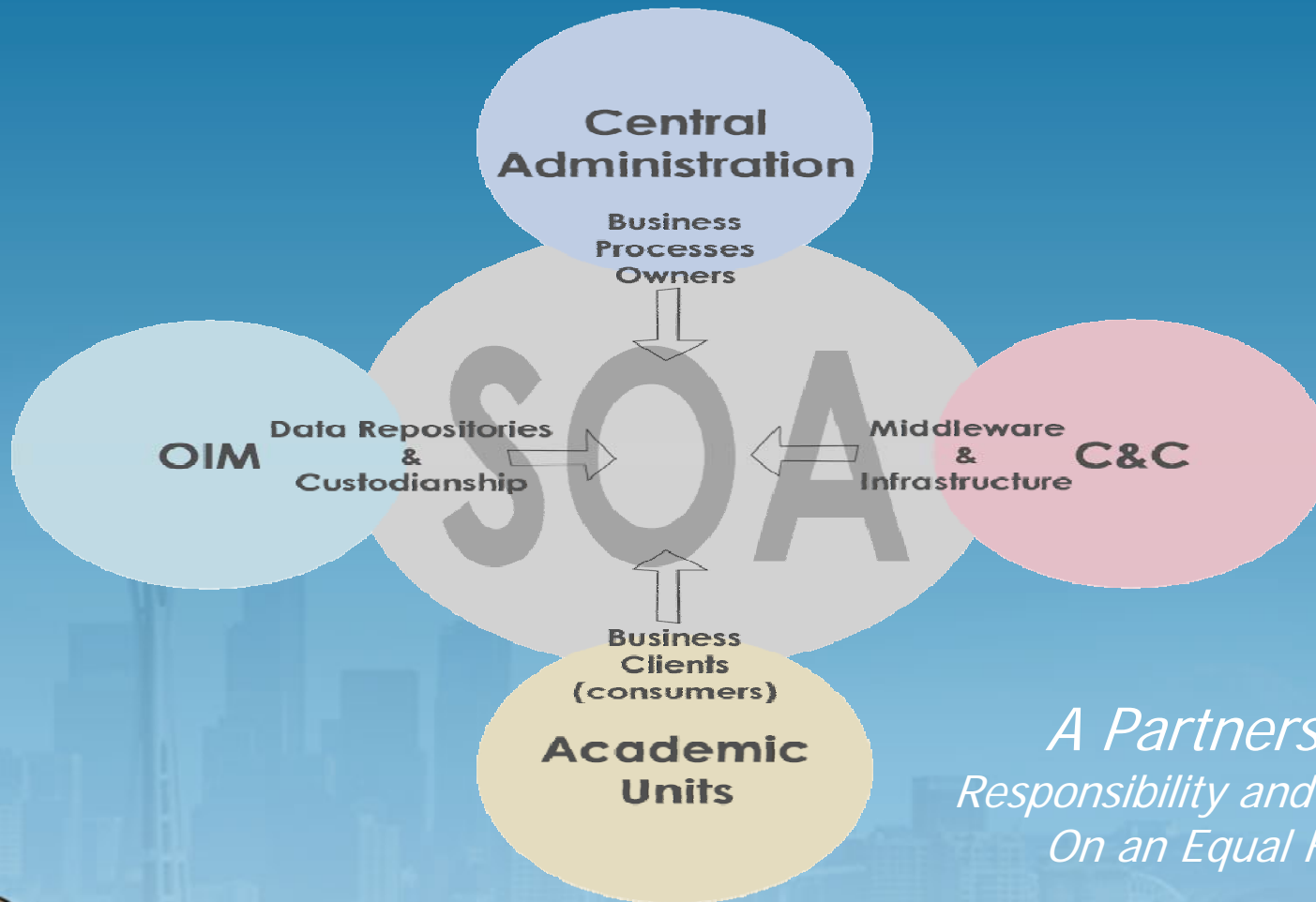
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What Now?



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Creating a Culture of Collaboration



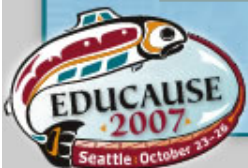
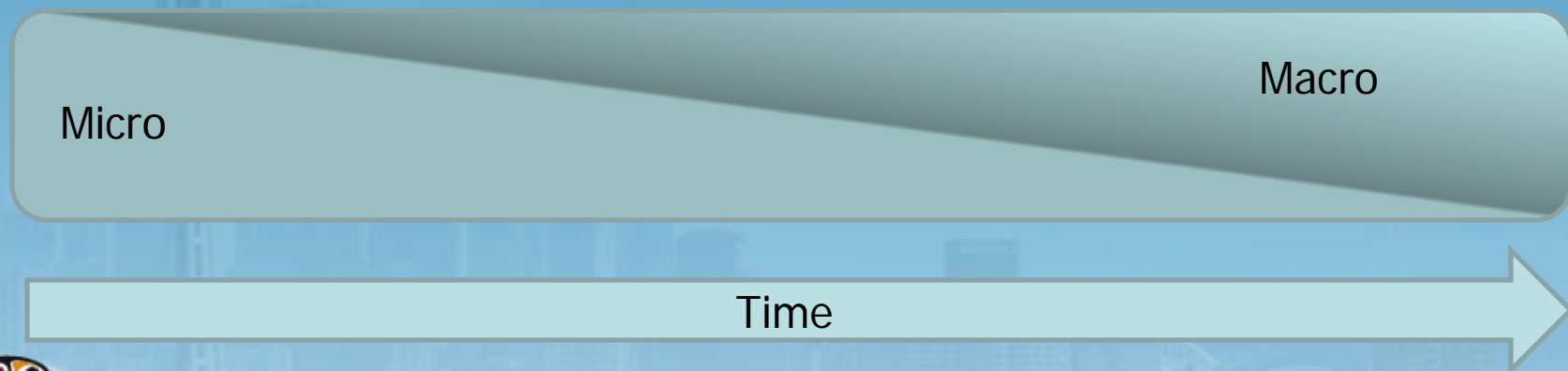
*A Partnership...
Responsibility and Leadership
On an Equal Footing*



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Recommendations

- Lead by example – create working, valuable services
- Foster a collaborative culture
- Start with micro-SOA, IT-driven
- Move gradually to macro-SOA, business driven



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More Recommendations

- *Governance* is key!
- Create an SOA *competency center*
- Develop SOA *policies, guidelines* and *best practices*
- Enforce policies by *process* and *community oversight*
- *Mandate* SOA *principles*
- Affect *cultural change*
- Establish a *Central Registry* of services
- Common *data definitions*
- *Resource model* for exposing data and processes



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Federated Governance Model



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An Evolving Governance Model

- Trust
- A Leader *full* community
- Collaboration
- Flattening



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Next Steps

- Tackle governance
- Inform the OIM Roadmap
 - Governance, architecture, technology, etc.
- Develop business success metrics
- Develop guiding principles and best practices
- Identify areas needing cultural change & *nurture* the change
- Training & evangelism



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Actualize The Vision

- *Free the data* ; free the *processes* ; free the business & academic units
- Put business/academic units *in the driver's seat*
- *Create business agility*
- Enable the institution to become an information provider to the world – by becoming so *internally*



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Questions and Discussion



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Discussion Points

- Where do you see opportunities?
- What do you need?



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