Cover Sheet for Bids *(All sections must be completed)*		**JISC**
Please indicate which strand you are applying for:	E1	
Name of Lead Institution:	University of Lincoln	
Name of Proposed Project:	Linkey	
Name(s) of Project Partners(s) (except commercial sector – see below)		
This project involves one or more commercial sector partners **NO** (delete as appropriate)	**Name(s) of any commercial partner company (ies)**	
Full Contact Details for Primary Contact: **Name:** Joss Winn **Position:** Senior Lecturer **Email:** jwinn@lincoln.ac.uk **Tel:** 07789485910 **Address:** Centre for Educational Research and Development, University of Lincoln, Brayford Pool, Lincoln. LN6 7TS.		
Length of Project: 12 months		
Project Start Date: **04/06/2012**	**Project End Date:** **31/05/2013**	
Total Funding Requested from JISC: £49,989.89		
Total Institutional Contributions: £32,457.81		
Outline Project Description This project will provide a detailed case study of the use of OAuth as an authorisation protocol at the University of Lincoln. Working closely with the university Library, we will examine how the OAuth 2.0 specification can be integrated into a 'single sign on' environment alongside Microsoft's Unified Access Gateway. Our intention is to show how OAuth 2.0 can be used as part of an access and identity environment in higher education that improves the student experience by: a) A consistent and user centric sign-in experience; b) A richer exchange of user information between applications; c) Easier development and implementation of new products.		
I have looked at the example FOI form at Appendix A and included an FOI form in this bid	**YES** (delete as appropriate)	
I have read the Funding Call and associated Terms and Conditions of Grant at Appendix B	**YES** (delete as appropriate)	

1. Our proposal

1.1 The Linkey project will provide JISC and the community with a Case Study and related technical outputs of an implementation of the OAuth 2.0 standard as part of an institution-wide strategy for Access and Identity Management at the University of Lincoln. As far as we know, the use of the OAuth 2.0 specification, which should be finalised at a forthcoming IETF meeting, has not yet been implemented by any other university in the UK. The primary driver for this is to improve the student experience and meet the following objectives:

1. Richer sharing of data between applications: A student or lecturer should be able to identify themselves to multiple applications and approve access to the sharing of personal data between those applications.
2. A consistent user experience (UX): We are initially aiming for 'consistent sign on' rather than 'single sign on', where the user is presented with a consistent UX when signing into disparate applications.
3. Rapid deployment: New applications that we develop or purchase should be easier to implement, plugging into either OAuth or the UAG and immediately benefiting from 1) and 2).

2. Building on recent innovation

2.1 One of the lasting outcomes of our Total Recal 'rapid innovation' project in 2010[1], was that undergraduate student and part-time Developer, Alex Bilbie, wrote the first (and only) OAuth 2.0 server for the CodeIgniter PHP development framework that we use. Since the Total Recal project, we've used OAuth 2.0 for a number of projects: Jerome,[2] data.lincoln.ac.uk, Zendesk,[3] Get Satisfaction[4], and more recently the cloud-based Orbital project.[5] Having been researched, developed and implemented under earlier JISC-funded projects, our OAuth 2.0 server has been formally adopted by central ICT Services, and consequently a more *user centric* approach to AIM is being adopted, where staff and students are gradually being presented with a consistent sign-in process, as well as given control over what services their identity is bound to and what permissions those services have.

3. Anticipated Technical Approach

3.1 Following a recent meeting between ICT and the Library, we agreed to take the following steps to achieving our above stated objectives:

1. To ensure a single, consistent identity for each person, all library (and ICT) applications that we operate internally must have Active Directory sign-in instead of local databases. Almost all of our applications achieve this already. This is the first step towards objective (3).

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[1] http://lncd.lincoln.ac.uk/projects/totalrecal
[2] http://lncd.lincoln.ac.uk/projects/jerome
[3] http://support.lincoln.ac.uk
[4] http://wwh.lincoln.ac.uk
[5] http://lncd.lincoln.ac.uk/projects/orbital/

2. All web-based applications must offer a consistent looking sign-in screen based on the current https://sso.lincoln.ac.uk design (which uses our Common Web Design[6]). This is the second step towards objective (3).
3. All systems must implement web-based single sign on via OAuth, SAML or ADFS, using either the Microsoft Unified Access Gateway (UAG)[7] or the OAuth server, which will include the 'SAML 2.0 Bearer Assertion Profiles for OAuth 2.0' specification.[8]

3.2 Most recently, the Orbital project has extended our OAuth 2.0 server to include some of the optional parts of the specification which had not been in use at Lincoln, such as refresh tokens[9] and using HTTP Authentication[10] with the client credentials flow.[11] This means that the server is now able to drop straight into a wider range of projects and services. However, many of our larger applications, such as WordPress, Exchange, Blackboard, HIP, EPrints and Sharepoint, remain disparate from one another, with no sharing of application data, except for that provided by the Active Directory.[12]

3.3 In the Total Recal project, we released version 1 of the server code[13] but have learned a lot since that project through integrating OAuth with other services and through our API-driven approach to development.[14] Version 2 of our OAuth server[15] is more representative of our current implementation and fully implements the latest draft (23) of the specification. Our single sign-on (SSO) service at https://sso.lincoln.ac.uk[16] is the gateway to our current OAuth 2.0 implementation.

3.4 At the time of writing, the current institution-wide use of OAuth extends to Zen Desk,[17] the Gateway,[18] the Staff Directory,[19] the Student Union website[20] and Posters@Lincoln.[21] Projects such as Jerome, and Orbital, as well as three 3rd year Computer Science student dissertation projects are using it, too. As stated above, our intention is to use OAuth alongside Microsoft's Unified Access Gateway (UAG) using SAML as a bridge to OAuth via the 'SAML 2.0 Bearer

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[6] http://cwd.online.lincoln.ac.uk

[7] https://www.microsoft.com/en-us/server-cloud/forefront/unified-access-gateway.aspx

[8] https://tools.ietf.org/html/draft-ietf-oauth-saml2-bearer-10

[9] https://tools.ietf.org/html/draft-ietf-oauth-v2-23#section-1.5

[10] https://tools.ietf.org/html/draft-ietf-oauth-v2-23#section-2.3.1

[11] https://tools.ietf.org/html/draft-ietf-oauth-v2-23#section-1.3.4

[12] An illustration of our existing AIM process can be seen at:
https://github.com/lncd/AIM-project/raw/master/SSOCurrentSituation.png

[13] https://github.com/alexbilbie/CodeIgniter-OAuth-2.0-Server

[14] http://www.slideshare.net/jacksonj04/api-driven-development

[15] https://github.com/alexbilbie/CodeIgniter-OAuth-2.0-Server/tree/v2

[16] An actual example of our current OAuth sign-in application can be seen at:
https://github.com/lncd/AIM-project/raw/master/secure-sign-in.png

[17] http://lncd.lincoln.ac.uk/about/how-we-work/tools-we-use/zen-desk/

[18] http://gateway.lncn.eu/

[19] http://phone.online.lincoln.ac.uk/

[20] http://www.lincolnsu.com/

[21] http://posters.lincoln.ac.uk/

Assertion Profiles for OAuth 2.0' specification. As such, we anticipate our implementation to look something like this:

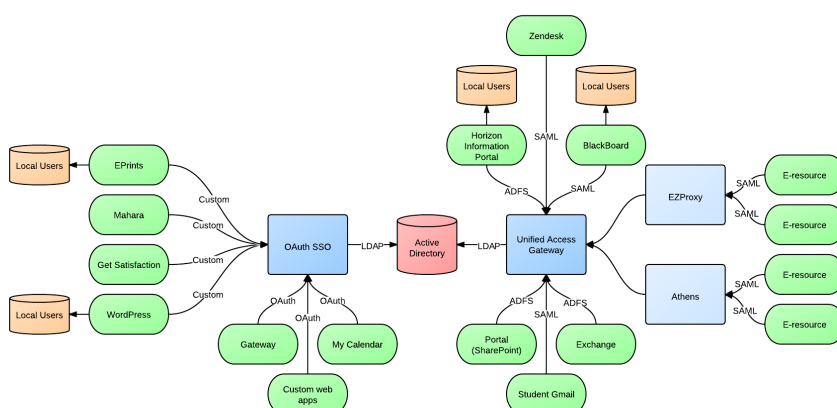   3.5 For Lincoln, a combination of OAuth and UAG is the preferred route to achieving a user-centric and consistent sign in process across all applications, bridging both the internally facing business applications managed by ICT (e.g. Sharepoint, Exchange, Blackboard) and the more outward facing academic and social applications such as those developed and run by the Library and the Centre for Educational Research and Development (e.g. WordPress, EPrints).

4. Methodology

       4.1 This is a twelve-month project, largely undertaken by Alex Bilbie, a Web Developer working in the central ICT Online Services Team. The work consists of research, development and a fully documented implementation of OAuth 2.0 as part of an institutional Access and Identity Management solution. This will result in a Case Study and accompanying source code, which are our main deliverables. The Principal User on the project will be Dave Masterson, Head of Electronic Library Services, who has been charged with improving the usability of our Library's online services. The Principal Investigator/Project Manager for the project will be Joss Winn, Senior Lecturer in CERD and co-ordinator of the LNCD group.[22] Tim Simmonds, Online Services Team Manager, will assume management and oversight of the technical implementation of both OAuth and UAG.

       4.2 The project will be run using the 'Crystal Clear' agile methodology, which we use on other development projects.[23] Crystal Clear is characterised by the following:

1. Seat people close together, communicating frequently and with goodwill.
2. Get most of the bureaucracy out of their way and let them design.
3. Get a real user directly involved.
4. Have a good automated regression test suite available.

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[22] http://lncd.lincoln.ac.uk
[23] https://en.wikipedia.org/wiki/Crystal_Clear_(software_development)

5. Produce shippable functionality early and often.

4.3 Within this environment, we practice open development,[24] using Github as a source code repository[25] and Pivotal Tracker to iteratively manage project tasks.[26] We have recently implemented an automated regression test suite and employ 'Continuous Integration' using the Jenkins software.[27] Such an environment will support Alex on this project by ensuring that his code is available for peer-review by colleagues and publicly available for scrutiny. Code will be constantly tested by Jenkins for quality assurance and thereby provide working code for regular user testing.

4.4 Dissemination will be both informal and formal. Community engagement will be on-going throughout the project using our project blog and Twitter accounts. We have demonstrated in past projects that we maintain active project websites and use social media effectively. More formal dissemination will take place through the use of Press Releases, a public workshop and the case study.

5. High-level Work Plan

Month	1	2	3	4	5	6	7	8	9	10	11	12
Initiate project	X											
Community Engagement	X	X	X	X	X	X	X	X	X	X	X	X
Gather user requirements		X	X	X	X	X	X	X	X	X	X	
Evaluate available technologies and options		X	X	X								
Design solution				X	X							
Technical development and implementation				X	X	X	X	X	X	X			
Documentation and Use Cases		X	X	X	X	X	X	X	X	X	X	
Write Case Study		X	X	X	X	X	X	X	X	X	X	X
Write/submit conference paper							X	X	X	X	X	X
OAuth workshop											X	
Close project												X

6. Benefits

6.1 We believe this is a distinctive bid that clearly builds on previous JISC-funded projects and further development at the University of Lincoln. It offers a number of benefits to project stakeholders:

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[24] http://lncd.lincoln.ac.uk/about/how-we-work/
[25] http://github.com/lncd
[26] e.g. Our tracker for the Orbital project
https://www.pivotaltracker.com/projects/366731
[27] http://orbital.blogs.lincoln.ac.uk/2012/01/18/jenkins-build-my-software/

6.2 To **students and academic staff**: The Linkey project benefits students and staff by providing a consistent, user centric experience when signing in to services across the university. Furthermore, they will be able to clearly identify the applications they have approved, their permissions and the data that those applications have access to, offering greater oversight over personal data.

6.3 To **technical staff**: The Linkey project will consolidate the Access and Identity Management processes at the university into a single directory of users across all applications. It offers the opportunity for technical staff to focus on the research, development and implementation of a robust 'consistent sign-on' infrastructure. Research into OAuth, SAML and UAG, for example, will be documented and shared with others, benefitting from peer-review via the project blog, workshops, conferences and responses to the case study. Much will be learned during the course of the project.

6.4 To the **University of Lincoln**: Improving Access and Identity Management is a strategic step towards improving the student and staff experience at Lincoln. Once implemented, it will allow the institution to respond more rapidly to changing expectations from our users and deploy a broader range of technologies more swiftly and consistently. By consolidating Access Management into two clearly delineated but joined methods (OAuth & UAG), we expect it to positively impact other processes, including the procurement of new applications, the security of data and remote working.

6.5 To the **university sector**: The case study, conference paper and workshop, will benefit colleagues from the sector by providing a number of opportunities to learn about the use of OAuth at Lincoln and consider how it could benefit their own institutions. This body of knowledge will accompany open source server code that works 'out of the box' and can be re-used for implementation by other HEIs.

6.6 The **public**: All project outputs will be publicly available for re-use, and all code from the Linkey project will be open source for use by other developers and organisations. To our knowledge (based on a question sent to the IETF OAuth mailing list), there are no existing open source implementations of the 'SAML 2.0 Bearer Assertion Profiles for OAuth 2.0', and our existing OAuth 2.0 server is the most complete open source solution written in PHP.

7. Stakeholder Analysis

Stakeholder	Interest/Stake	Importance
Staff and students	Improved User Experience; richer sharing of data between applications. Greater oversight of academic identity.	High
Technical staff	Consolidation of services; efficiencies gained through re-use of previous work. Provision of new infrastructure; personal and professional development of staff.	High
University of Lincoln	Consolidation of services; increased agility and more rapid deployment of new and more flexible services.	High

Other HEIs	A case study and workshop on the use of OAuth in a HEI. Opportunities for knowledge transfer. Re-use of open source OAuth server.	Medium
JISC	Value for money, in terms of re-use of previous JISC-funded work. Provision of open source code for re-use by the sector. Distinctive case studies and a well-documented project website. Showcase of innovative use of new technologies.	High
Public	Value for money, in terms of re-use of previous JISC-funded work. Provision of open source OAuth server for re-use.	Low

8. Deliverables

1. A case study of our implementation of OAuth 2.0 together with Microsoft's UAG product. We will provide draft sections of the final case study in 12 monthly blog posts, allowing for early peer-review.
2. Continued development of our open source OAuth 2.0 server, including an implementation of the 'SAML 2.0 Bearer Assertion Profiles for OAuth 2.0' specification and other relevant extensions to the main standard. We aim to produce a 'drop in' solution for OAuth 2.0, in a similar way that the SimpleSAMLphp project supports SAML implementations.[28]
3. A public workshop on the use of OAuth 2.0 in Further and Higher Education.
4. A conference/journal paper, based on our case study.

9. Risks

9.1 The Linkey project is proposing to document and share our experience of implementing a new Access and Identity Management solution for the university, which is already planned to take place. Linkey is therefore not the determining factor for the project, but *dependent* on the existing project (which is independently risk managed) and offers value to the sector through what we learn, whatever risks and challenges arise in the implementation.

9.2 Clearly there is a risk by not improving our Access and Identity Management processes and systems (e.g. staff and student dissatisfaction due to a poor user experience; the inability to further innovate because of the 'chilling' effect of out-of-date technology). We feel these outweigh any risks internal to the project. Through work done so far, we are confident that we have sufficient skills and experience among team members to undertake each of the deliverables. The project has senior management support from the Head of ICT Services.

9.3 Our main question at this stage is to what extent Microsoft's UAG and our OAuth 2.0 implementation are complimentary services and what Access and Identity Management processes are each best suited to? We will address this concern through further research and consultation with vendors very early into the project.

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[28] http://simplesamlphp.org/

9.4 As always, there is a small risk that team members may be absent during the project due to illness, but this will be mitigated by close collaboration on work packages and sharing of responsibilities as is typical of agile methodologies. The project relies on Alex Bilbie to a large extent, which is a risk to the project should he be unable to work. However, other university staff are also familiar with OAuth, having used and contributed to the development of the server. As the project proceeds, this risk will decrease as other staff benefit from our experience of the implementation and can fill in for Alex if need be.

9.5 We have worked on a number of previous projects, which has given us confidence in our proposed method and approach, but there are still areas specific to the domain of Access and Identity Management, which we need to investigate more thoroughly. Through close and regular engagement with the JISC community, we hope to receive valuable peer-review from established experts in this domain. From the point of view of our ICT systems, many of the technological and related cultural changes are being worked through and positively demonstrated in our experience on other projects such as Zen Desk, the Gateway and Orbital.

10. Sustainability

10.1 The main deliverable of the Linkey project is a case study of work, both on-going and planned at the University of Lincoln. The implementation work is not dependent on JISC-funding and is part of our existing ICT strategy.

10.2 Our proposal is borne out of lessons learned from the JISC-funded Total ReCal, Jerome and Orbital projects. We are clearly committed to developing and improving our research, teaching and learning environments and see our work on this project as integral to this commitment. The University can demonstrate that past JISC-funded projects continue to benefit our staff, students and the wider community. As summary of our approach and recent projects has been published as a JISC case study on 'institutional approaches to openness'.[29]

10.3 We will engage with stakeholders in a number of ways throughout the project (blog, Twitter, conferences, a workshop and case study) so as to ensure that our work is widely known, understood and re-used. All documentation and source code will be made available under appropriate open licenses, thus allowing for further scrutiny, re-use and improvement.

11. IPR

11.1 All project documentation, including the Case Study and blog, will be licensed under a CC-BY license. Code will continue to be licensed under an open source MIT license.

12. Engagement with the Community

12.1 We blog regularly across all projects[30] we work on and maintain an active Twitter account of all project work.[31] The software outputs of the project will be MIT licensed and developed and hosted on Github, a 'social coding'

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[29] http://www.jisc.ac.uk/whatwedo/topics/opentechnologies/openeducation/lincoln-university-summary.aspx
[30] http://lncd.lincoln.ac.uk/projects
[31] http://twitter.com/lncd

platform that encourages and facilitates code forking and collaborative development. An announcement will be made on the IETF OAuth working group mailing list and we will use that platform as our main method of communicating project progress to the OAuth community. We will maintain a public mailing list for discussion of OAuth 2.0 in the HE sector and invite participating projects on the programme to join. We will hold a one-day workshop at the University of Lincoln towards the end of the project to discuss our work and offer practical advice on its implementation. We will write a conference paper, based on the case study, for submission to a relevant conference on access and identity. We will, of course, contribute to any JISC and related OER programme meetings and conferences.

13. Previous Experience of the Project Team

13.1 **Alex Bilbie**: Developer.[32] Alex is a developer for the Online Services Team within ICT Services and a part-time undergraduate Computer Science student, finishing his final year. He has worked on the JISC-funded JISCPress, Total Recal, Jerome and Linking You projects. He developed the university's Common Web Design and the university's OAuth 2.0 server. He is a contributor to the CodeIgniter PHP framework and has also contributed to the HTML5 Boilerplate framework, WordPress and the OAuth 2.0 specification. Alex was invited to talk about OAuth at the Eduserv Federated Access Management conference, November 2011.[33]

13.2 **Dave Masterson**: Head of Electronic Library Services.[34] Dave has responsibility over all technical, electronic, systems, acquisitions and cataloguing services in the Library. Dave was recently charged with improving the user experience of library applications and will act as the Principal User on the Linkey project, co-ordinating other user engagement.

13.3 **Tim Simmonds**: Online Services Team Manager.[35] Tim has worked for the university for over 20 years and is in charge of all online services managed by the ICT department. He will bring this experience to the project and represent ICT Services as a Stakeholder, overseeing the implementation of the UAG and OAuth implementations.

13.4 **Joss Winn**: Project Manager.[36] Joss is a Senior Lecturer in the Centre for Educational Research and Development and has been Project Manager on a number of JISC-funded projects. He will manage the Project and report to JISC and other Stakeholders. Joss joined the University in 2007 to work on the implementation of the Institutional Repository and is Co-ordinator of the LNCD group, an institution-wide group focusing on technology for education.

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[32] http://phone.online.lincoln.ac.uk/abilbie
[33] http://www.slideshare.net/alexbilbie/oauth-20
[34] http://phone.online.lincoln.ac.uk/dmasterson
[35] http://phone.online.lincoln.ac.uk/tsimmonds
[36] http://phone.online.lincoln.ac.uk/jwinn