

Distr.  
GENERAL

Working Paper No.16  
24 April 2009

ENGLISH ONLY

**UNITED NATIONS STATISTICAL COMMISSION and  
ECONOMIC COMMISSION FOR EUROPE  
CONFERENCE OF EUROPEAN STATISTICIANS**

**EUROPEAN COMMISSION  
STATISTICAL OFFICE OF THE  
EUROPEAN COMMUNITIES (EUROSTAT)**

**ORGANISATION FOR ECONOMIC COOPERATION  
AND DEVELOPMENT (OECD)  
STATISTICS DIRECTORATE**

**Meeting on the Management of Statistical Information Systems (MSIS 2009)**  
(Oslo, Norway, 18-20 May 2009)

Topic (iii): Architecture

**FROM RED TO GREEN: THE ROLE OF ENTERPRISE ARCHITECTURE IN THE ONS  
CORPORATE IT STRATEGY**

**Invited Paper**

Prepared by Simon Field, Office for National Statistics, United Kingdom

**I. INTRODUCTION**

1. In November 2008, the Board of the Office for National Statistics (ONS) gave its full support to a new Corporate IT Strategy. The strategy was developed in a collaborative fashion, involving all business directorates. A theme, which permeates the document, is that of a journey being undertaken by ONS to transform its estate “from red to green”. What makes this IT Strategy different from previous ones published by ONS is the integration of IT strategy with the business strategy, and the implication that this journey is not one being embarked upon by the IT directorate, but by the whole organisation. The “red to green” theme, its translation into a coherent strategy, and the monitoring of its progress, were developed from the Enterprise Architecture approach at ONS.

2. This paper describes how the ONS Corporate IT Strategy grew out of its Enterprise Architecture (EA) approach. It introduces the ONS EA framework, and the analysis that led to the “red to green” theme. The paper also shows how the development of a set of architectural bricks, and its incorporation in an EA tool to assess the ONS IT estate, is being used to monitor progress in implementing the strategy, and helping the organisation make investment decisions that support the new strategy.

**II. EA FRAMEWORK AT ONS**

3. In 2005, the IT Architecture team at ONS developed a framework to provide a consistent approach to architecture analysis (see Figure 1 below). At that time an Enterprise Architecture approach was not widely accepted within ONS, and the term “Architecture” was avoided (and still is) as being too removed from practical business management. Whilst the framework proved useful to the architecture team in understanding the context for work, and in assessing approaches, attempts to socialise it more widely across the business at that time proved unsuccessful.

# The Big Picture

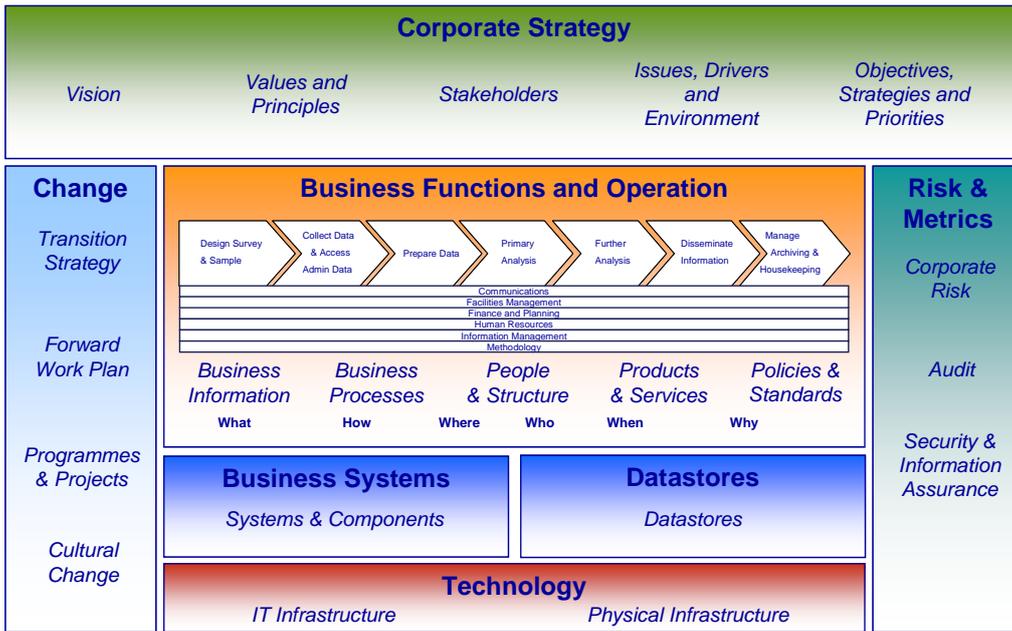


Figure 1 – ONS Enterprise Architecture Framework – The Big Picture

4. Towards the end of 2007, the business leadership at ONS began work on preparing its Statistical Work Programme (SWP) for 2008/9, a publication required under the Framework for National Statistics. The Information Management Directorate was asked to provide input to this process.

5. The framework was used to present the relationship between the precarious state of many of the IT systems and platforms and the work of the business directorates, which would be further developed under the proposed SWP (see Figure 2 below). Without investment in the underlying IT software and hardware infrastructure, the success of the SWP would be put at risk.

# The Big Picture - Today

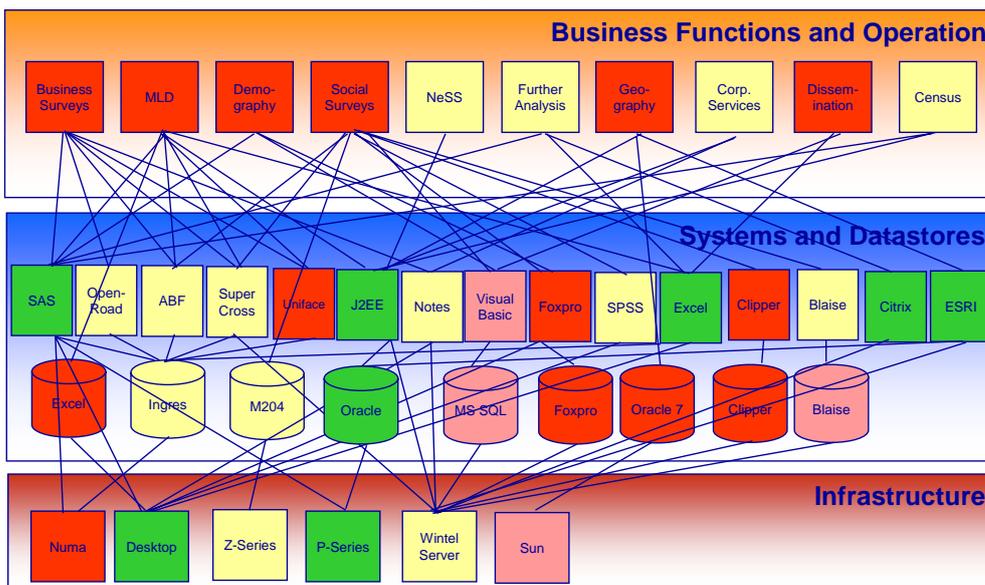
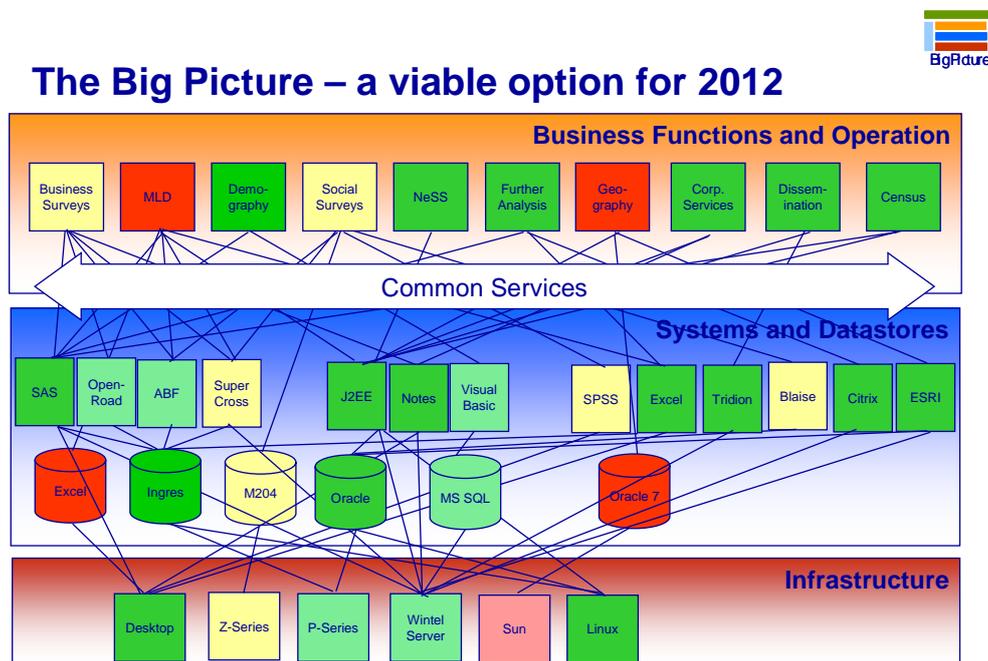


Figure 2 – Analysis of Current Situation (as of Spring 2008)

6. This was an intentionally simplistic approach, using just four colours in a traffic-light manner to represent an expert, yet subjective assessment of each component’s “state of health”. This was broadly a view on the systems’ sustainability – some items, for example, were marked down on account of the lack of available resources to support them, either within ONS or from the wider skills marketplace, while others were marked down due to their out-of-date software or hardware platform.
7. The “Business Functions and Operation” layer was coloured according to the worst colour inherited from the layers underneath. Whilst this might be seen to be a pessimistic view of the business function’s state of health, it follows the maxim that “you are only as good as your weakest link”. In IT terms, having a modern software environment can, for example, be seriously compromised if it is deployed on elderly unsupported hardware with inadequate disaster recovery protection.
8. The Systems and Datastores domain was also simplified. In fact its contents, which focus on various technologies, should really be placed in the Infrastructure domain, but these technologies have become a familiar language across ONS, even among senior management, and much more so than the 500 or so business systems that utilise them.
9. Assessed against the framework described in paragraph 6 above, it became clear that a number of key statistical operations could be vulnerable due to the poor state of health of their underlying IT systems. If a new programme of work, developing new statistical outputs, was to be begun, it would need to incorporate some investment in the underlying IT systems as part of its overall programme.
10. Following extensive discussions with business management, a vision was developed that expressed how the systems could evolve over the coming four or five years, with much of the investment coming as an integral part of the proposed statistical work programme (see Figure 3. below). This was a practical vision that recognised that it may not be possible to turn everything green within that limited period.



**Figure 3 – Aspirational position for 2012**

11. The desire to transform our systems, and in turn, business operations, “from red to green” entered the language of the organisation, and seems to have been taken as an opportunity for collaboration and collective responsibility. This simple representation appears to have gone a long way towards removing the long-standing misconception that IT systems and infrastructure have little to do with statistical operations.

### III. A NEW CORPORATE IT STRATEGY

12. ONS had last published an IT Strategy in December 2004, and so it was considered time for a new publication that would reflect this more recent thinking. With “red to green” having entered into common language at ONS, it was decided that the central theme of the strategy would be based around this corporate effort to transform its IT estate. As the CIO wrote in the management summary of the new strategy document:

*“In general, the ability of ONS to adapt and respond to change is limited by its IT, rather than being facilitated by it.”*

13. The strategy document adds more detail to the general direction set by the “current” and “future” Big Pictures by breaking up the business of ONS into seven strategy areas:

- a) Collection
- b) Statistical Operations
- c) Dissemination
- d) Statistical Tools
- e) Communications
- f) Corporate Services
- g) Technical Services

Each one of these is described, at a fairly high level, in terms of the business direction, and the trends and changes in technologies and systems that will support that business direction.

14. The strategy does not encapsulate a single plan – it is too large a programme of work to be managed as a single programme under a single plan. It is a strategy that will take more than five years to deliver, and so needs to be infused across all of the projects and programmes that are initiated over the course of the next five years. A key part of the strategy document, therefore, makes a direct connection between the seven published business strategic aims, and guiding architectural principles that are used to steer individual projects, and influence design decisions.

15. ONS has adopted 20 guiding architectural principles, clustered into five high level principles:

- a) Reusability
- b) Integrability
- c) Sustainability
- d) Corporate Asset
- e) Security

The strategy document contains a matrix that relates the five architectural principles to the seven strategic aims, highlighting with supporting text, those cells that identify a strong connection between a particular principle and an aim to which it lends strong support. This provides traceability from day-to-day decisions, such as those that take place in architecture reviews, through the IT Strategy to corporate aims and objectives. This is similar to the Common Requirements Vision approach advocated by Gartner. See Figure 4 below for a simplified version of this matrix (with ticks replacing the more detailed text in the relevant cells).

Guiding Principles	Re-use	Integra- bility	Sustain- ability	Corporate Asset	Security
Strategic Aims					
To provide authoritative, timely, and accessible statistics and analysis that impact on decision-making across UK society, anticipate needs and support public accountability			✓	✓	
to be a trusted and leading supplier of national government statistical expertise and surveys			✓		✓
To maintain a dynamic portfolio of statistical sources which reflect changing data needs	✓				
To deliver the sources portfolio in a way which meets user expectations of quality, within the available resources		✓	✓		
To minimise the burden on respondents for all survey collection	✓			✓	
To adapt rapidly to changing demands through flexibility in our people and systems, and the reinvesting of resources through efficiency, innovation, and methodology and technical improvements	✓	✓	✓		✓
To identify social and technological change that will impact on what we do and how we do it	✓	✓		✓	

**Figure 4 – Simplified matrix relating corporate aims to high-level architectural principles**

16. This matrix, together with its supporting text in the strategy document, makes the key connection between the strategic direction set out under the “red to green” banner, and the architectural governance mechanisms that will be used to drive projects in the desired direction.

17. The development of the strategy document included workshops with all the business executives, and follow-up meetings with individuals, to ensure that its content reflected business priorities and was understood. It was approved at a meeting of the Executive Management Group, and subsequently presented to, and endorsed by, the ONS Board in November 2008.

#### IV. TRACKING PROGRESS

18. The use of a subjective, though expert, assessment of current state, and potential future state, was adequate as the basis for agreeing a strategy, but it is not sufficiently finely grained, nor sufficiently measurable, to enable the tracking of progress towards an objective over a number of years.

19. During 2008, ONS began to document its IT standards, and roadmaps for those standards, in the form of architectural bricks. Their initial development, which took place during a series of workshops drawing on expertise across ONS, involved the creation of a spreadsheet document for each of seventeen topics:

- Database Management Systems
- Statistical Tools
- Application Servers
- Reporting Tools
- Storage
- Web Content Management
- Encryption
- Server Operating Systems
- Desktop Operating Systems
- Service Bus / Messaging
- Directory
- Document Management
- ETL
- Email & Calendaring
- Development tools
- Web Servers
- Search

20. Each spreadsheet shows graphically a four year roadmap for the tools and technologies involved in that particular topic. Colours are used to indicate whether the solution is considered to be strategic, tolerated, retiring or not in use. Whilst some solutions may be considered strategic throughout the four year period, the status of others may change over time. See figure 5 below for an example spreadsheet.

21. In addition to the graphical representation, each row is also complemented with a text entry, describing in more detail the context for that tool. For example, a tool may be considered to be strategic, but only within certain business or systems contexts, and this requires some explanation.

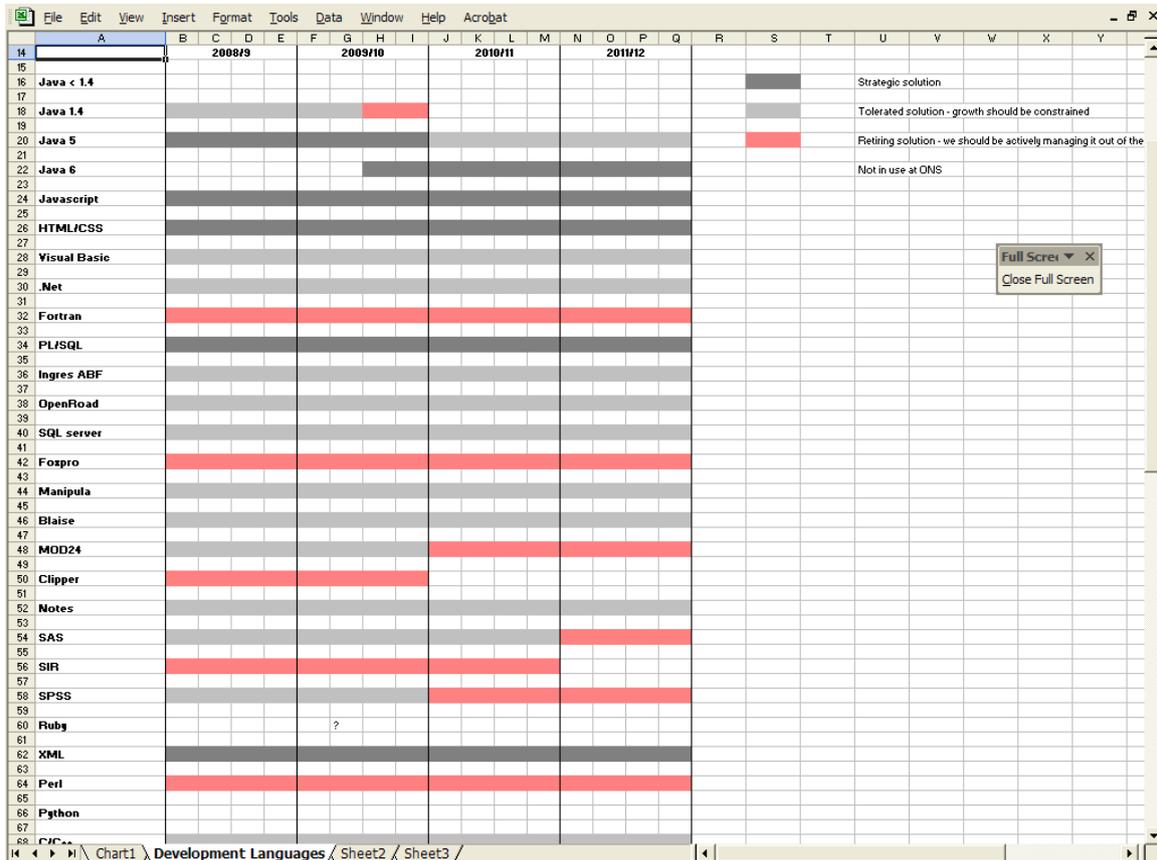


Figure 5 – Example Architectural Brick spreadsheet

22. These bricks serve a number of purposes. In addition to providing guidance to those planning upgrades and change, they also help document and transmit knowledge in an environment where some projects may be managed or architected by external contractors.

23. There is also a clear relationship between those systems in the estate that contain “retiring” components (e.g. systems that rely on elderly Clipper software), and those that were coloured red in the Big Picture. By developing a simple scoring system, and by encapsulating these bricks into the Enterprise Architecture model that is being used to model the IT estate, it has become possible to quantify the extent of “redness” across the IT estate.

24. ONS has been using Trough Architect from Trough Technologies to model its IT estate, and this initiative was given new emphasis following the decision to consolidate data centres and migrate existing servers to data centres operated by Fujitsu on behalf of a cross-government shared service. Figure 6 below shows a graphical representation of part of the metamodel implemented in Trough Architect. It describes systems, their components and datastores, and the underlying software of which they are composed, as well as the hardware on which they are deployed at the infrastructure level, and the business ownership at the business operational level.

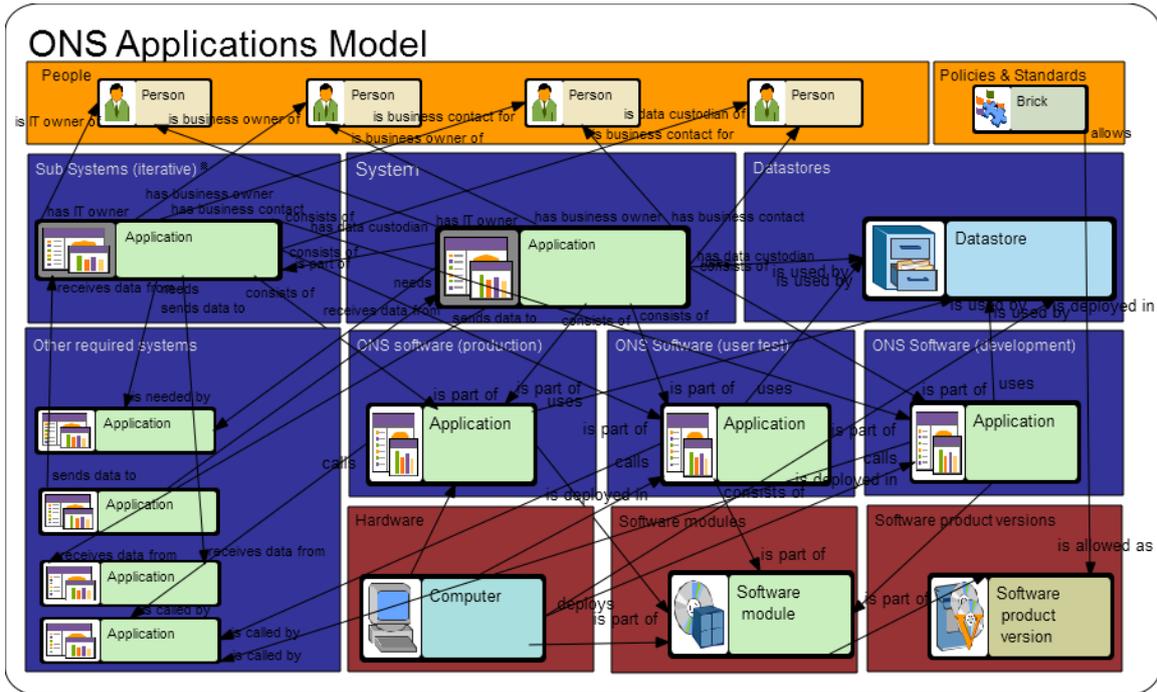


Figure 6 – Representation of part of the ONS Troux metamodel

25. The model itself was populated over a period of approximately six months. Whilst most of the infrastructure information could be imported electronically from other existing information sources, the knowledge for many of the connections that show which systems are actually subcomponents of larger system and how they relate to the business, had to be captured manually. New processes have been developed to ensure that this model can be kept up to date.

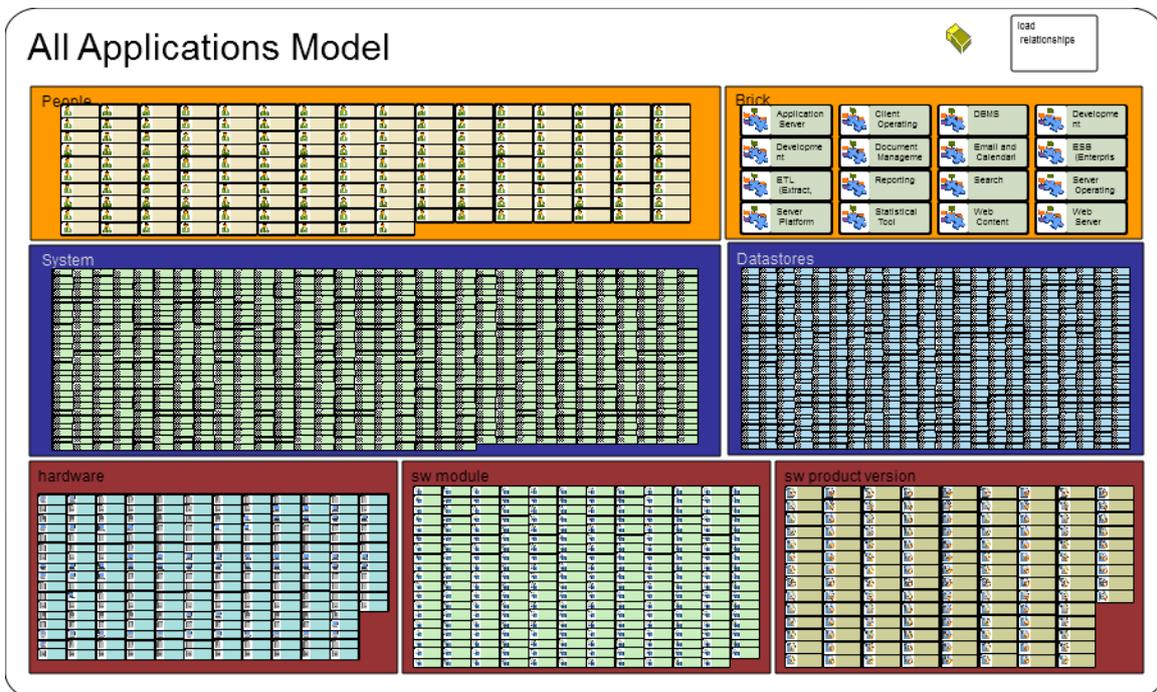


Figure 7 – Extract of populated ONS model in Troux

26. Figure 7 above shows a view of part of the populated model in Troux, containing approximately 80% of the ONS IT estate. There are over 500 system components. The core knowledge is really contained within the linkages which show how the systems are connected, and also how the system components relate to the architectural bricks (shown in the top right-hand corner of the model).

27. Examining the whole model is of limited value, but a powerful feature of Troux Architect is the ability for a user to specify a query and produce a custom view containing a subset of the model contents. An example output from this is given in Figure 8 below, which shows the systems and components associated with the Living Costs and Food Survey.

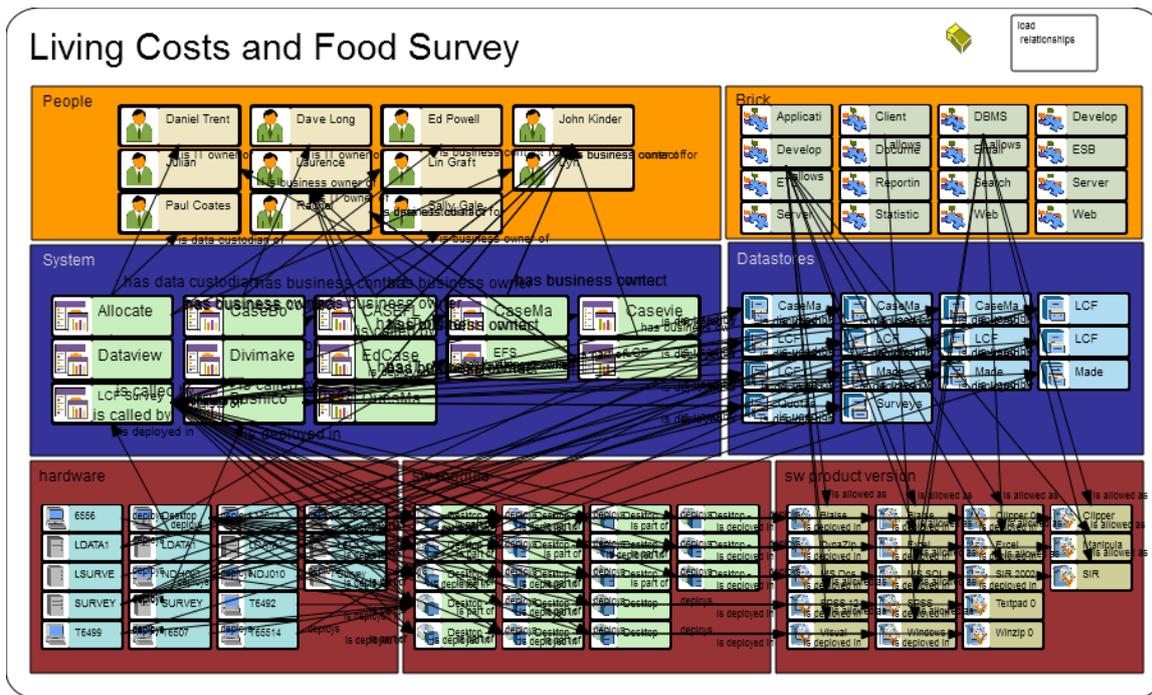


Figure 8 – Example custom view

28. Another valuable feature of the Troux system is the ability to develop custom reports using Cognos, with results being generated in a variety of formats. This feature was used by the team to implement a number of prototype scoring models that could assign values to the brick categories (Strategic, Tolerated and Retiring) and produce aggregate scores for business systems and their components expressing the systems’ “degree of redness”.

29. This is not an ideal definition of “degree of redness”, but was accepted as a practical compromise. A solution might be totally compliant with the architectural bricks, but it may still be architecturally flawed. Using good components does not guarantee a sound solution that is “fit for purpose”. A better measure would be compliance with defined architectural patterns, which themselves should be composed of compliant architectural bricks. This is, in practice, how the ONS solutions architecture team works, but it has yet to satisfactorily document its architectural patterns in such a way that they can be used to automatically score large numbers of systems and their components.

30. An example of one of these experimental reports is shown in Figure 9 below. Please note that at the time this paper was prepared, various scoring models were being considered, and so this may not be the final scoring model adopted at ONS (though it does illustrate the capability that is being utilised). In this example, three separate scores are first calculated, for the system’s platforms, data management, and application layers. These are then aggregated to an overall score. The report contains automated colour formatting so that individual “red” components can be easily identified, in addition to an overall assessment of the system.

31. These reports are beginning to prove a valuable addition to review meetings between IT staff and business management teams. They highlight those aspects of a system that are most vulnerable, and which are therefore most in need of investment for upgrading or re-engineering. It is hoped that this type of clear report will help strengthen the collaborative effort to improve the IT estate, and make all staff across ONS feel like stakeholders in the corporate IT Strategy.

	A	B	C	D	E	F	G	H	I	J
	Application	Brick Category	Brick	Brick-Software Product Version weighting	Software Product Version	Software Module	Modifier	Compliance Score	Averages	
2	Living Costs and Food Survey Software (LCF)	application	Development Language	20	Blaise 4.2	Desktop - Blaise 4.2		100	0.2	
3			Development Language	80	Blaise 4.6	Desktop - Blaise 4.6		100	0.8	
4			Development Language	20	Clipper 0	Desktop - Clipper 0		100	0.2	
5			Development Language	20	Excel 2007	Desktop - Excel 2007		100	0.2	
6			Development Language	80	Manipula 4.6	Desktop - Manipula 4.6		100	0.8	
7			Development Language	20	SIR 2002	Desktop - SIR 2002		100	0.2	
8			Development Language	20	SPSS 12	Desktop - SPSS 12		100	0.2	
9			Development Language	80	Visual Basic Enterprise Edition 6	Desktop - Visual Basic Enterprise Edition 6		100	0.8	
10	<b>application</b>			<b>20</b>					<b>0.4250</b>	
11	data mgmt	DBMS	20	Clipper DBMS 0	Desktop - Clipper DBMS 0		100	0.2		
12			20	Excel DBMS 2007	Desktop - Excel DBMS 2007		100	0.2		
13			80	MS SQL Server 0	Desktop - MS SQL Server 0		100	0.8		
14			20	SIR DBMS 2002	Desktop - SIR DBMS 2002		100	0.2		
15			20	SPSS DBMS 12	Desktop - SPSS DBMS 12		100	0.2		
16	<b>data mgmt</b>			<b>20</b>					<b>0.3200</b>	
17	platform	Client Operating System	100	Windows XP sp2	Desktop - Windows XP sp2		100	1		
18	<b>platform</b>			<b>100</b>					<b>1.0000</b>	
19	<b>Living Costs and Food Survey Software (LCF)</b>			<b>20</b>					<b>0.5817</b>	

**Figure 9 – Example Cognos report from Troux**

32. In addition to a business system specific report, a much larger summary report can be generated, allowing the team to assess the overall “state of health” of the IT estate periodically. It is this capability that has enabled the team to create a finely grained version of the original “red to green” Big Picture, based this time not on a high-level subjective view, but on a more objective assessment of how each business system and its components are currently deployed, configured and maintained.

33. As a consequence of this capability, a new Corporate Key Performance Indicator is being included in the Corporate Scorecard to report on progress in the effort to turn the ONS IT estate “from red to green”.

*The author wishes to acknowledge the contribution of Jan Jones, Chief Architect at ONS, and her team of Troux practitioners, Rebecca Trickey and Ann Brodie, who have so successfully turned the concepts described in this paper into a practical reality.*