NORTHROP GRUMMAN

DEFINING THE FUTURE

Service Oriented Architectures: SOA How Is It Estimated?

ISPA/SCEA 2007
New Orleans, LA

12-15 June 2007

Kevin Snyder
Operations Research Analyst

Janelle McDonald
Operations Research Analyst

SCEA
The Society of Cost Estimating and Analysis

Agenda

- Motivation for Estimating SOAs
- DNI View Towards Costs of SOA
- Cost Estimator's Guide to SOAs
- The SOA Business Case
- Potential SOA Pitfalls
- Potential Estimating Methods
- The Challenge

NORTHROP GRUMMAN

Motivation for Estimating SOAs

- In March 2006, the Director of National Intelligence's (DNI) Chief Information Officer (CIO) released the Intelligence Community (IC) Service-Oriented Architecture (SOA) strategy document
- The document highlights the shift from the current "need-to-know" paradigm to one of "need-to-share" and the technology required to achieve this change
- The current IC's IT infrastructure can be characterized as individual stovepipes with tightly-coupled, point-to-point interfaces
- To guard against another September 11, a more open, loosely-coupled, service based infrastructure that enables data sharing is not only needed within each Intelligence Agency, but needed throughout the entire Community
- As mandated by the Office of the Director of National Intelligence (ODNI), the SOA concept is the solution
- Given that the DNI has instructed the IC to implement this technical framework, we as a society of cost estimators need to be abreast of this issue and be prepared to respond to this challenge

DNI View Towards Costs of SOA

- **The ODNI's strategy document identifies some high level cost benefits of SOA to the IC**
  - Reduces development costs by acquiring pre-built capabilities
  - Lowers maintenance costs and consequently the total cost of ownership through few "instances" of function and few software licenses
- **Estimators are instinctively skeptical of technical claims that cut cost, but even more so in the case where both acquisition and Operations and Maintenance (O&M) costs are reduced**
  - No such thing as a free lunch
- **As cost analysts within the IC, we need to be cognizant of the expectations coming from upper management and national leaders as we brief estimate results up the chain of command**

NORTHROP GRUMMAN

Cost Estimator's Guide to SOAs

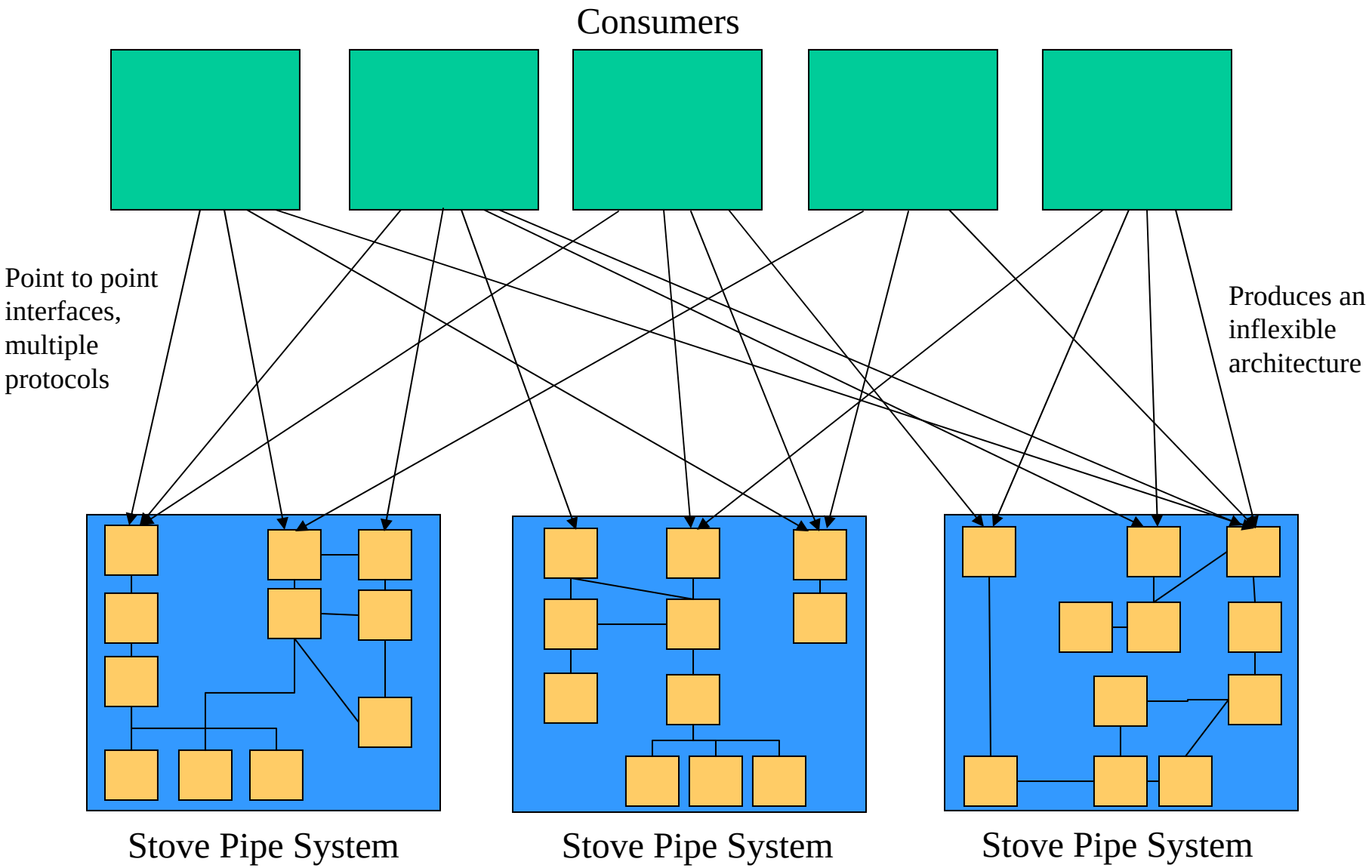
- **SOA is the next generation of computer-based architectures**
  - 1970s: Mainframe-based architecture (centralized systems)
  - 1980s: Client-server architecture (distributed applications)
  - 1990s: N-tier architecture (distributed systems)
  - Today: SOA (distributed services)
- **A standards based (e.g., Extensible Markup Language (XML) messaging, Simple Object Access Protocol (SOAP), etc.) software architecture consisting of an of an application front-end, services, and an enterprise level service bus**
- **Often characterized by:**
  - Flexible architecture
  - Agile mission execution
  - Rapid development and integration of new capabilities
  - Governance
  - Workflow
  - Loosely coupled interfaces

SOA is an architectural implementation methodology, not a new technology, COTS package, or programming language

NORTHROP GRUMMAN

Cost Estimator's Guide to SOAs

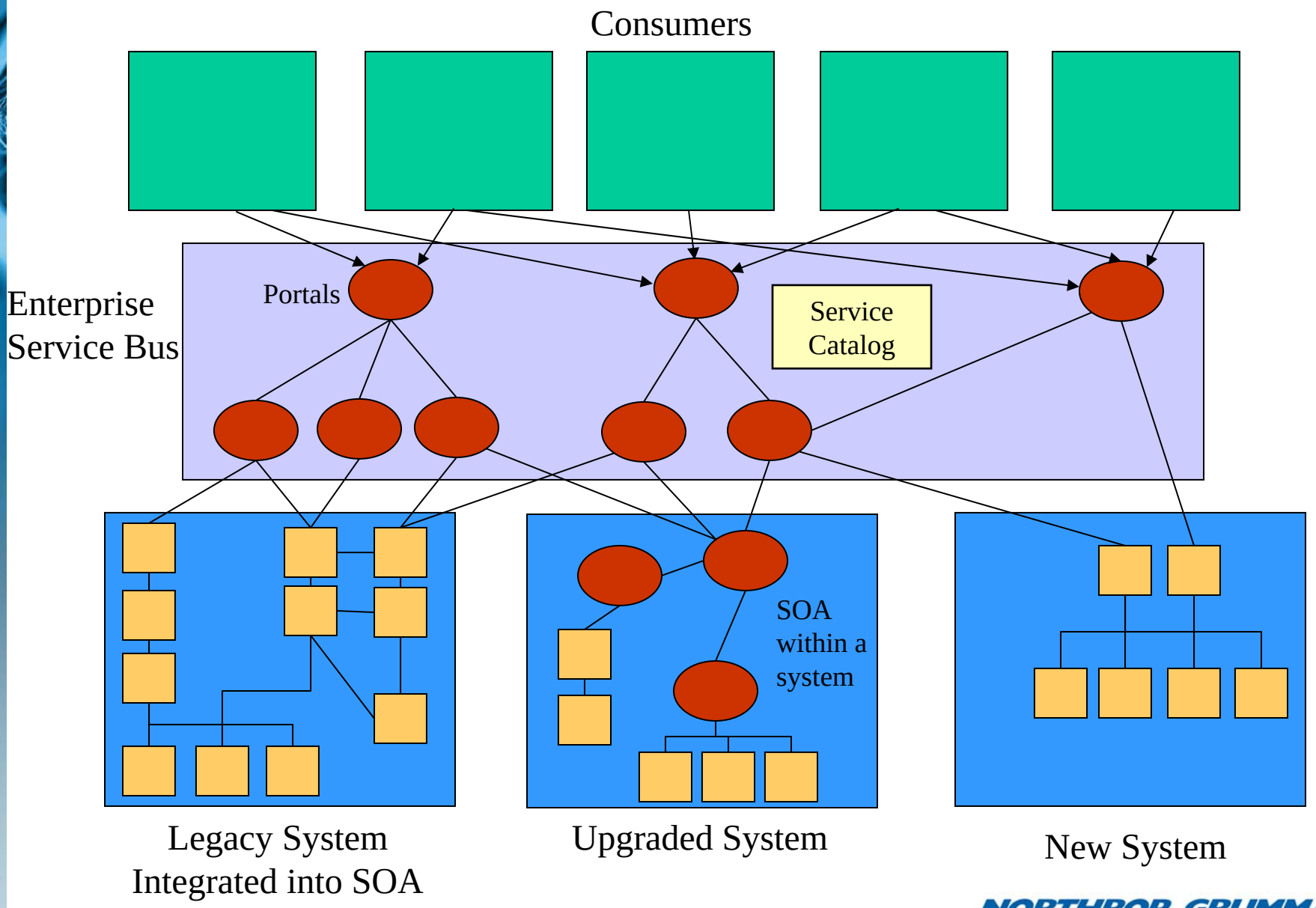
Traditional Architecture Within IC



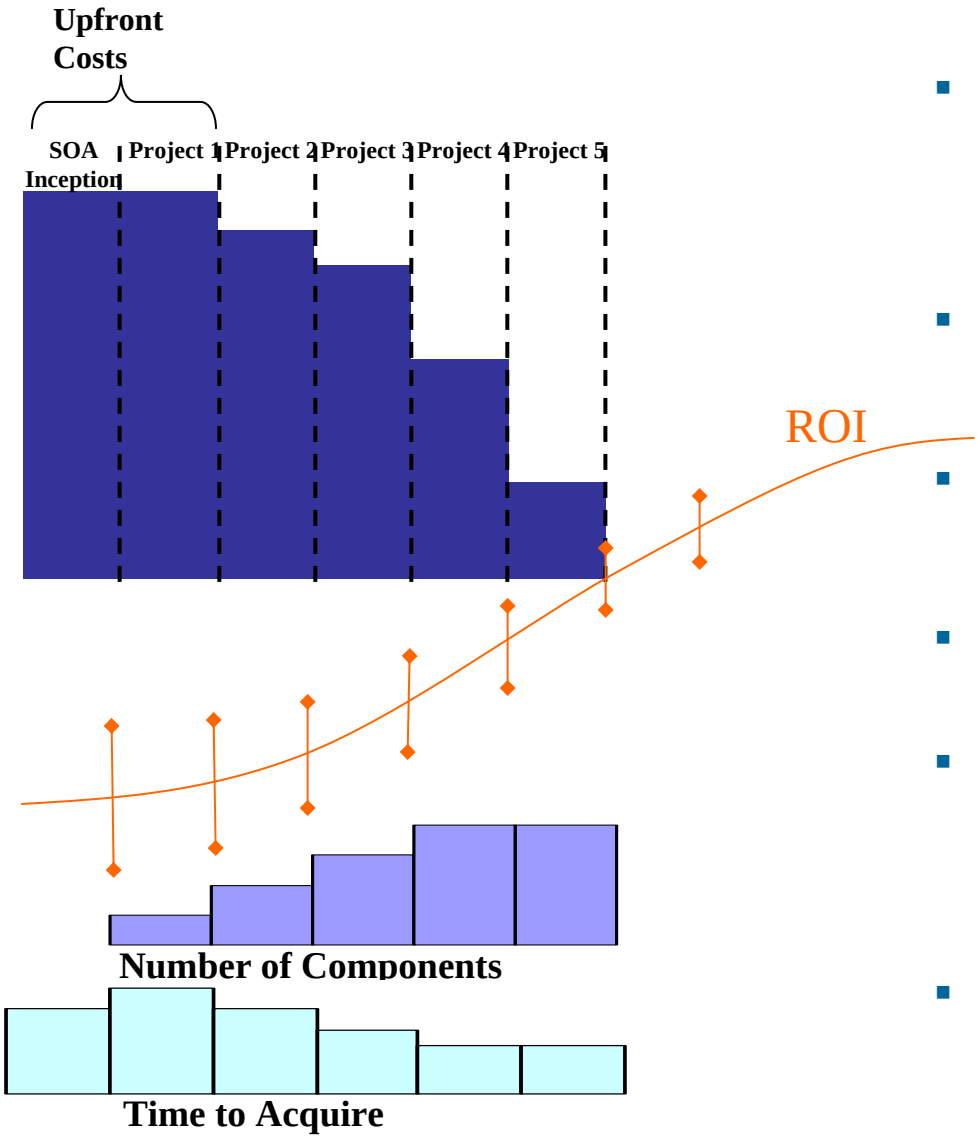
NORTHROP GRUMMAN

Cost Estimator's Guide to SOAs

SOA Implementation Within IC



The SOA Business Case



- The upfront costs for implementing a SOA along with the first project utilizing the SOA is much greater than if the project is implemented within the current architectural concept
- The argument is that the benefits of a SOA implementation reduce the acquisition costs for each additional project
- As a result, the ROI is realized after several projects have been implemented within the SOA construct
- With the addition of each project, the number of components within the SOA grow
- With this growth (and as the SOA further aligns with the organization's business processes), the number of shared services grows and there are more opportunities for reuse
- As a result, acquisition time required for each project is shortened and costs are reduced

Graphic derived from *Building the Business Case For* SOA, Idriss, Mekrez

Potential SOA Pitfalls

- **Beware of false promises: What is proven in commercial realm rarely translates directly into the IC**
  - Technical insertion
  - Reuse
    - What ensures that one contractor will reuse the service of another contractor?
    - In the highly competitive world of defense contracting, will contractors be willing to share propriety solutions?
  - Long-term O&M
  - Use current skill set and existing tools and technologies
    - The retention of domain knowledge is certainly beneficial
    - Could incur costs as developers adapt to new architectural concept and possibly may be resistant to change
  - Recurring savings or cost avoidance
  - Systems Engineering, Integration & Test, and Program Management (SEITPM) cost savings/avoidance
  - Lack of proof
    - Dangerous to incorporate promised cost efficiencies into a standard methodology without proof
    - May lead to false results and poor decisions
- **Major changes in the way an organization does business may lead to unforeseen disadvantages**
  - Potentially create additional work and eliminate some of the expected cost savings

NORTHROP GRUMMAN

Potential SOA Pitfalls (cont.)

- **High upfront costs**
  - While SOAs could potentially result in lower recurring cost, there is a premium associated with the initial development of a service
  - The up-front acquisition of a service enabled component is higher than that of a tightly coupled non-service enabled software component
- **Extended time to realize the return on investment of upfront costs in savings**
  - The additional upfront costs for enabling services within an architecture may be brought down by the recurring savings as new entities begin to use service as opposed to developing additional stovepipe services to perform the same functionality
  - However, it may take several new entities to realize enough savings to breakeven on the up-front investment and unless new entities are introduced fairly quickly, the breakeven period could be extensive
- **Misinterpretation of the benefits (both cost and technical)**
  - Some benefits of SOAs may not have a large impact in your organization or mission
  - Without a full Cost Benefit Analysis (CBA) and Return On Investment (ROI) study SOA implementation may lead to misguided investments that never reap benefits at the value expected
- **Cost growth associated with a poorly defined "To-Be" architecture and poor up-front business process re-engineering and governance**
  - Service Orientation may require business process changes at some level; however, failing to thoroughly engineer business processes during the early development phase may result in an suboptimal architecture

NORTHROP GRUMMAN

Potential Estimating Methods

- **Dave Linthicum offers a formula for calculating the cost of implementing a SOA:**
  - Cost of SOA = (Cost of Data Complexity + Cost of Service Complexity + Cost of Process Complexity + Enabling Technology Solution)
  - Good start to the problem, but how do you cost the complexity of something?
  - Again, same problem of subjective engineering judgment
- **Collect historical cost data for the various computer based architectures and attempt to quantify the cost deltas associated with each new "architectural evolution"**
  - Data collection is often the most time consuming and frustrating process of any analysis
  - Normalizing the data for a true "apples to apples" comparison could prove difficult
- **Utilize metrics from existing SOAs in the commercial world**
  - Credit Suisse, and international financial services group is commonly referenced as an example throughout the IC
  - SOA supports over 100,000 users and 7,000,000 service invocations per week (Newcomer 19)
  - Able to achieve 70% reuse of their 2500 services throughout the company and a 30-70% cost reduction for systems development and integration as compared to previous approaches (Credit Suisse)
  - Remember, commercial world does not always translate into the IC
- **While the technology is still maturing, the perfect SOA estimating methodology most likely does not exist**
  - However, as cost analysts we must work alongside the appropriate technical SMEs to develop logical assumptions and carefully document all costing caveats
  - Be heavily involved in the technical definition of the architecture and be prepared to voice concerns
  - Dedicate a considerable amount of time to the risk process
  - Do not be bullied by the engineers
- **Cost estimating is part science and part art; time to use the right side of your brain**

The Challenge

- **Lack of historical cost data enabling a defendable cost estimate**
- **Lack of technical maturity to define a comprehensive baseline**
- **Biased technology advocates**
- **High visibility**
  - Heavy push from national leaders
  - Impacting most precious national means
- **Politically charged urgency**
  - Fast moving train and the cost community need to get in front of it
  - Trying to estimate the egg before we even found the rooster

Questions ?

NORTHROP GRUMMAN

Sources

- *Credit Suisse*. IONA Case Studies. Apr 2007 <http://www.iona.com/info/aboutus/customers/casestudies/cs_credit_suisse.htm>
- Director of National Intelligence Chief Information Officer Intelligence Community Enterprise Architecture. *Intelligence Community Service-Oriented Architecture Strategy Document DRAFT Version 0.19*. 31 Mar 2006: 1-26.
- Linthicum, Dave. *How Much Will Your SOA Cost? Here Are Some Guidelines*. 19 Nov 2006. InfoWorld; Real World SOA. Mar 2006 <http://weblog.infoworld.com/realworldsoa/archives/2006/11/how_much_will_y.html
- Mekrez, Idriss. *Building the Business Case For SOA*. BEA World 2005. Feb 2007 <http://certification.bea.com/certification/BEA-72.pdf>
- Newcomer, Eric. *Service Oriented Architecture*. 19 Dec 2006. Proceedings of OMG Workshops. Mar 2007 <http://www.omg.org/news/meetings/workshops/SOA_MDA_WS_Workshop_CD/00-T-01_Newcomer-Part1.pdf>

NORTHROP GRUMMAN