SOA Design Principles and the Internet of Things

2014 IBM SOA Architect Summit

SOA on Your Terms
And Our Expertise
In 1917, Forbes compiled first 100 largest American companies list

In 1987, Forbes published its 100 list & compared it to its 1917 list

Of the original group, **61 had ceased to exist**

Of the remaining 39, only **18 had managed to stay in the top 100.**

“It’s not the strongest of the species that survives, nor the most intelligent, but the one most responsive to change.”

—Charles Darwin—
Agenda

- Extending the Business with API’s
  - The Internet of Things
  - IoT References
The Business of APIs

Not having an API today is like not having a website in the 1990s...

stores  (800) ###s  web sites  Web APIs

$7bn worth of items on eBay through APIs”
Mark Carges (Ebay CTO)

The API which has easily 10 times more traffic than the website, has been really very important to us.”
Biz Stone (Co-founder, Twitter)

Grow revenues...

“The adoption of Amazon’s Web services is currently driving more network activity than everything Amazon does through their traditional web sites.”
Jeff Bar (Amazon evangelist) / Dion Hinchcliffe (Journalist)

... While reducing overhead
What is a Business API?
- A Business API is a **public persona** for an enterprise; exposing defined assets, data or services for public consumption
- A Business API is **simple** for app developers to use, access and understand
- A Business API can be easily invoked via a browser, mobile device, etc.

What Value Does a Business API Provide?
- Extends an enterprise and opens new markets by allowing external app developers to easily leverage, publicize and/or aggregate a company’s assets for broad-based consumption

What “assets, data or services” are exposed via a Business API?:
- Product catalogs
- Store listings
- Order status
- Inventory
- Social interaction
**Benefits**

- New business opportunities
  - New markets
  - Increase customers
  - Enhance branding
  - Competitive advantage

- Extend development team
  - Increase innovation
  - Increase scale

- Partner/supplier alignment

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**Challenges**

**Business strategy**

- Infrastructure
  - Security
  - Creation
  - Scalability

- Operational control
  - Publish
  - Analyze
  - Monitor
Business Design is an end-to-end Endeavor
Change without Ownership is fraught with Peril

Example: Modularity from BPMN categories

There are three basic types of sub-models within an end-to-end BPMN model:

1. **Collaboration Processes**: exchanges between 2 independent business entities.
   
   ![Collaboration Processes Diagram](image)

2. **Abstract (public) processes**: End to end view from a participant point of view.
   
   ![Abstract Processes Diagram](image)

3. **Private (internal) processes**: single business owner and a main core entity
   
   ![Private Processes Diagram](image)

Generally: Proper modularization of coherent (with purpose) building blocks will lead to loose(r) coupling and high(er) cohesion (tolerance of change)
The Myth and the Hype

Myth 1: “API management is completely different from SOA and SOA will bog you down”

- All APIs are Services
- Not all APIs are good Services
- Not all Services make good APIs

API Management is a Natural Extension of SOA

API Management and Service Management are converging for a more agile approach both inside and outside the enterprise
Myth 2: “SOAP is Dead, APIs are always REST”

- Does Anything in Technology Ever Die?
  - Look at COBOL

- Does it still have its purposes? Yes, Depends… SOAP is not just legacy

- If you are going external and trying to drive adoption REST is the love of most developers today because it’s easy… for them
The Myths and The Hype

Myth 3: “No governance is needed with API management, this allows companies to innovate faster”

- **Good Luck with That!**
- Remember External APIs are a product and your company’s external persona
- Some form of governance is necessary
The Myths and The Hype

Myth 4: “APIs are not versioned”

- That’s like saying you don’t need to change a baby’s diaper
- They are versioned and you need to manage the change and protect your consumers
  - Don’t expose minor version changes to the consumers. You don’t want it to appear that you are changing your APIs on them all the time. They won’t build a business on your APIs if you do.
- Remember APIs are a product and your company’s external persona. Version wisely!
The Myths and The Hype

Myth 5: “API management is SOA governance rebranded”

- **API Management** - APIs Are a Product Therefore Need to Be Managed Like One
  - Need Business Model for Each API (Free, Developer Pays, Developer Gets Paid, etc)
  - Need a Marketing Plan
  - Need Legal Reviews
  - Need Analytic Reports Reporting back to the Business
  - Need to define developer management strategy
  - Need to be very rapid in response to market

- **SOA Governance** – Presides over entire enterprise
  - Establishing Organizational Transformation
  - Enterprise Business Vision and IT alignment
  - Service Development Lifecycle
  - Service Portfolio Management
  - Change management
  - Procurement of resources
  - Longer process

- **API management is a natural extension of SOA governance**
The Myths and The Hype

- Myth: “You only need one ‘bus’ ”
  - We have a different opinion, gateways and integration buses fulfill importantly different topological roles. With that said, some use cases require only a gateway, other use cases only an integration bus and yet others require both

- Myth: “You don’t need to integrate your API management solution with any other middleware”
  - If not, then how are you going to share metadata about available data, services, endpoints etc.? And how are you going to manage and enforce policies all the way from the point of engagement to the point of record?
Agenda

- Extending the Business with API’s
- The Internet of Things
- IoT References
Billions of devices, sensors, and chips that are able to communicate via the Internet makes up “The Internet of Things”

“The Internet of Things refers to uniquely identifiable objects (things) and their virtual representations in an Internet-like structure.” – Wikipedia (link)

“The Internet of Things is the network of physical objects that contain embedded technology to communicate and sense or interact with their internal states or the external environment.” – Gartner (link)

“The Internet of Things (IoT) represents a new construct in the information and communications technology (ICT) world that is occupying the minds of IT vendors, service providers, and systems integrators as it represents huge potential for new streams of revenue and new customers.” – IDC (link)

“The Internet of Things represents an evolution in which objects are capable of interacting with other objects. Hospitals can monitor and regulate pacemakers long distance, factories can automatically address production line issues and hotels can adjust temperature and lighting according to a guest’s preferences, to name just a few examples.” – IBM (link)
Internet of Things Video

The Internet of Things – An IBM Video
Program your world with The Internet of Things (IoT)

SmartPhones and other devices are themselves IoT’s and have apps that interact with IoT’s via services and API’s

IoT provides information from and ability to control “things” (physical objects)

IoT data increases the load on DB’s and opportunities for Big Data analytics

Messaging appliance to process large volumes of events in near real time

Access to IoT via the Internet / network /

New applications and SOA services to take advantage of IoT. Combine with existing SOA services for new capabilities with customers and partners

Opportunities to increase business with customer and trading partner communities
Forecasts call for billions and billions of connected devices

“In 2020, Over 30 Billion Connected Devices Will Be In Use.” – Gartner (link)

“Driven by reducing price per connection and the consequent rapid growth in the number of machine-to-machine (M2M) connections, we expect the number of connected objects to reach 50bn by 2020 (2.7% of things in the world).” – Cisco (link)

“There will be 212 B devices or things connected to networks by 2020” - IDC (link)

“There are more than 10 billion wirelessly connected devices in the market today; with over 30 billion devices expected by 2020..” – ABI Research (link)
The Internet of Things will require new approaches for CIOs and new skills for IT professionals

“The converging Nexus of Forces and the Internet of Things are creating the digital industrial economy. In 2014, CIOs must embrace and help lead this transformation. Doing so will require novel approaches and radical new thinking combined with unwavering attention to operational performance.” – Gartner (link)

“As it becomes easier and easier to design and develop smart systems, competitive differentiation will shift away from unique, vertically focused product features towards how the product is actually used and how the product fosters interactions between and among users in a networked context.” – Harbor Research (link)

While CIOs recognize the importance of the right staff to enterprise success, they are finding it increasingly difficult to find skilled talent in the locations they require, for a price they can afford.” - IDC (link)

“Survey found that 51 percent of CIOs are concerned that the digital torrent is coming faster than they can cope and 42 percent don't feel that they have the talent needed to face this future.” - IDC (link)
There are many other related terms around the IoT Trend topic

**Machine to Machine (M2M)**

“Machine to machine (M2M) refers to technologies that allow both wireless and wired systems to communicate with other devices of the same ability. M2M uses a device (such as a sensor or meter) to capture an event (such as temperature, inventory level, etc.), which is relayed through a network (wireless, wired or hybrid) to an application software program, that translates the captured event into meaningful information (for example, items need to be restocked).” – [Wikipedia](https://en.wikipedia.org/wiki/Machine-to-machine)

“The Web of Things is a vision inspired from the Internet of Things where everyday devices and objects, i.e. objects that contain an embedded device or computer, are connected by fully integrating them to the Web. Examples of smart devices and objects are wireless sensor networks, ambient devices, household appliances, RFID tagged objects, etc.” – [Wikipedia](https://en.wikipedia.org/wiki/Web_of_Things)

“A sensor is a converter that measures a physical quantity and converts it into a signal which can be read by an observer or by an (today mostly electronic) instrument.” – [Wikipedia](https://en.wikipedia.org/wiki/Sensor)

**Wireless Sensor Network**

“A wireless sensor network (WSN) of spatially distributed autonomous sensors to monitor physical or environmental conditions, such as temperature, sound, pressure, etc. and to cooperatively pass their data through the network to a main location. The more modern networks are bi-directional, also enabling control of sensor activity.” – [Wikipedia](https://en.wikipedia.org/wiki/Wireless_sensor_network)

**Ubiquitous Computing**

“Ubiquitous computing (ubicomp) is a post-desktop model of human-computer interaction in which information processing has been thoroughly integrated into everyday objects and activities.” – [Wikipedia](https://en.wikipedia.org/wiki/Ubiquitous_computing)
Internet of Things – Trend Drivers, Challenges, and Implications

Drivers
• Proliferation of low cost, smaller, mobile devices, wearables, smarter sensors, and chips that can be embedded in anything and can communicate over the Internet
• Advanced wireless networks
• Ongoing development of smart cities, cars, and houses
• Enhanced connectivity infrastructure
• An increasingly connected culture

Challenges
• Network speed/capacity
• Standards / Interoperability
• Management of Big Data
• Security
• Application Development / Partner ecosystems
• Culture, skills, and business processes

Implications
• Leading edge companies will use IoT to develop competitive advantages
• Leading software companies have a window of opportunity to develop new applications and services
• The IoT will result in new innovative applications and services we can not dream of today.
• IT will have to have Big Data figured out in order to take advantage of data streams from IoT
• IoT makes securing the enterprise more complex
• IoT will result in new calls for Privacy laws
Internet of Things – Concepts for Usage

Demand & Response - By using real-time and historical data, an Internet-of-Things demand and response system (e.g. energy and utilities) can calculate and forecast the balance point over a time range. Information from traffic sensors is provided to commuters to avoid heavy traffic. Traffic lights and on/off ramps can adjust, improving traffic flow.

Logistics - The healthcare, grocery, pharmaceutical, chemical and transportation industries are looking to IoT solutions to aid them in logistics-based solutions. End-to-end delivery of goods involves multiple steps in the logistic chain, such as storage containers in various warehouses, multiple vehicle transport and vendors across multiple locations. IoT information is used to monitor and log temperature and humidity information to ensure end-to-end delivery quality. An Internet-of-Things approach can help logistic companies to optimize shipping schedules and differentiate their services.

Smart Home & IoT Service Innovations - Home appliances, consumer electronics, residential construction, telecommunications, home security, and healthcare are a few industries using interconnected smart applications and devices to form an Internet-of-Things service platform for developing new service innovations and adapt business models to emerging industry scenarios.
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Internet of Things – Selected IBM Resources and Links

- **Recent Press Releases**: [IBM and Libelium Launch Internet of Things Starter Kit](https://www.ibm.com) and [Internet of Things Gets Major Distance Boost From IBM and Semtech](https://www.ibm.com)


- **DeveloperWorks**: [Mobile Messaging and M2M articles](https://www.ibm.com) and [Fabric for Sensor Network Management and Data Transfer](https://www.ibm.com)

- **Redbook**: [IBM Intelligent Operations Center for Smarter Cities](https://www.ibm.com) and [Building Smarter Planet Solutions with MQTT and IBM WebSphere MQ Telemetry](https://www.ibm.com)

- **Website**: [Smarter Planet](https://www.ibm.com)

- **Healthcare Example**: [Connected Home Health](https://www.ibm.com)

- **Energy Example**: [IBM Intelligent Utility Network Solution](https://www.ibm.com) and [Smart metering and beyond](https://www.ibm.com)

- **Video**: [The Internet of Things](https://www.ibm.com)

- **Academy of Technology**: [Internet of Things](https://www.ibm.com)


- **White Paper**: [Driving innovation through the Internet of things](https://www.ibm.com)
Internet of Things – Selected IBM venues on Social Media

• Blog: asmarterplanet
• Tumblr Blog: A Smarter Planet tag: Internet of Things
• DeveloperWorks Community: Fabric for Sensor Network Management and Data Transfer and Mobile and M2M
• Developerworks Blog Search: Internet of Things
• IBM Research Blog Post: Mobile data for the Internet of Things
• Facebook: People for a Smarter Planet
• Twitter: @SmarterPlanet
• Pinterest: Building a Smarter Planet
• Google+: Smarter Planet
Thank You