Application-Oriented Networking
How Cisco IT Uses AON to Simplify Application Development and Maintenance

A Cisco on Cisco Case Study: Inside Cisco IT
Overview

- **Challenge**
  Accelerate application development and reduce costs

- **Solution**
  Move repeatable application functions to the network, in an inline Application-Oriented Networking (AON) module

- **Results**
  Deployed three AON applications to-date, reducing application costs, accelerating development, and increasing security

- **Next Steps**
  Use AON for more Cisco external and internal applications
Challenge: Reduce Duplicate Development Efforts

- Cisco monitors 10,000+ applications in ten application development environments (ADEs)
- 900 full-time engineers work on application development and enhancement
- Developing one new capability, like SSL, requires a separate development effort for each:
  - Environment: cisco.com, intranet, manufacturing extranet
  - Server technology: WebSphere, Borland Application Server, Microsoft SQL Server
  - Language: Java, C, Perl
Challenge: Accelerate time to market and reduce costs

- Goal: standardize selected application functions and make them independent of technology or environment

- Internal survey revealed benefits of moving common application functions to the network:
  - Retire 100,000 lines of code and thereby...
  - Reduce application maintenance
  - Free up hardware and memory on application servers
Solution: Application-Oriented Networking

- Offload common application and service support functions to the AON module for Cisco switches and routers
- Function is developed once, implemented once in AON, and then used over and over
- Eliminate the need to write and test code for multiple environments

AON is part of Cisco’s vision for the Intelligent Information Network (IIN)
**Solution: What AON Is—and Is Not**

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<th>What AON Is</th>
<th>What AON Is Not</th>
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<td>Service broker in service-oriented architectures (SOAs)</td>
<td>General-purpose application server</td>
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<td>Integration broker in application integration</td>
<td>Web Services orchestration engine</td>
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Service broker in service-oriented architectures (SOAs)
Integration broker in application integration
Security integrator

General-purpose application server
Web Services orchestration engine
**Solution: Current AON Functions**

<table>
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<th>Security</th>
<th>Reliability</th>
<th>Manageability</th>
<th>Targeted Service</th>
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<td>Reliable delivery</td>
<td>Message and transaction-level logging</td>
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<td>termination (XML)</td>
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<td>HTTP-to-JMS protocol</td>
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<td>Digital signatures</td>
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<td>SSH or STA</td>
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Solution: Invisible Message Router

- Developer simply inserts a short line of XML code to request that the AON module perform a function for its application flow before it arrives at the server.
Solution: Deployment

- AON Modules reside in Cisco 6509 Routers in San Jose data center
- Developers use AON Development Studio, an Integrated Development Environment (IDE) to develop flow, or execution plan
- AON Management Console used for configuration

AON Development Studio
Results: AON Applications To-Date at Cisco

- HireRight: Reduced development and debugging time from 240 to 120 hours
- Pre-Order Check Service: Reduced time to add digital certificates for new partners from one day to two hours
- Virtual Logistics Network: Acquired flexibility to support partners’ multiple payload formats
Use Case: Hire Right

- **Challenge:** Cisco HR employee had to manually enter results of third-party background checks for potential new hires, creating two-day backlog

- **AON Solution:** Vendor that checks new-hire backgrounds has a secure, real-time connection to Cisco HR database
Use Case: Hire Right (Contd.)

- **Results:**
  
  Avoided 45-60 minute data entry per background check, and eliminated backlog

  Developed application in half the time planned (120 hours)

  Reduced server memory needs from 1800 MB to less than 100MB

  Increased security
Use Case: Hire Right

AON functions used:

- SSL v3 encryption with bidirectional authentication
- Certificate validation
- User authentication and logging
- Schema validation
- XML payload transformation between two dissimilar databases
- Content inspection
- Message verification and logging
Use Case: Pre-Order Check Service

- Challenge: Enhance the service that Cisco trading partners and customers use to validate their orders, and make it available to partners that do not use Web Services

- AON Solution: Replace existing Web Service with AON-based service
Use Case: Pre-Order Check Service (Contd.)

- Results:
  - Increased security
  - Enhanced convenience for partners by providing the service in a multi channel, multi protocol format
  - Accelerated implementation
  - Will be able to quickly add support for the planned Rosetta Net Web Services standard
Use Case: Pre-Order Check Service

AON functions used:

- SSL v3 encryption with bi-directional authentication
- Tibco-JMS integration
- SOAP-XML transformation
- Standard activity logging
- Message tracking
Use Case: Virtual Logistics Network

- Challenge: Find a simpler way to connect the Cisco logistics database to the 4PL partner; avoid customized integration; support different message payload formats used throughout the world

- AON Solution: Use AON to enable an event-driven architecture rather than a polling architecture
Use Case: Virtual Logistics Network (Contd.)

- Results:

  Reduced dependence on vendors and technology, a result of supporting a payload-neutral business protocol (AS2)

  Simplified architecture, which costs

  Switched to standards-based integration

  Gained visibility into the message payload
Use Case: Virtual Logistics Network

AON functions used:

- Authentication
- Encryption
- Reliable delivery
- Message tracking

- Transformation
- Mapping
- Application logic
- Schema validation
Results: Lower Costs, Faster Development

- Return on investment
  - Reduced development costs, application costs, and server memory and storage costs
  - Licensing cost avoidance--$300,000 to-date for Web Services management software
  - Avoidance of increased IT headcount

- Faster application delivery, twice as fast for HireRight application
Enhanced security

Most exploitable application vulnerabilities result from the implementation, not the algorithm; with AON function is tested thoroughly and implemented once

Ability to change or update application functions or policies in one place and apply them to all applications
Next Steps: More AON-Based Applications

- Integration with salesforce.com, an application services provider (ASP)
- Radio Frequency ID (RFID) for loading docks
- RFID for asset tracking in global centers, helping to locate misplaced network and server equipment
- Lease Record Service
- Approved Vendor List
- Mobility
- Contract Coverage
- Serial Number Check
- POS
Use Case: Integration with salesforce.com

- Challenge: Perform authentication and authorization within the Cisco network, not the ASP, with the goals of single sign-on and greater security and access control

- AON Solution: Used AON to integrate salesforce.com with the Cisco Lightweight Directory Access Protocol (LDAP)
Use Case: Integration with sales force. com (Contd.)

- Anticipated Results:
  - Adding authentication and certificate management in just weeks
  - Enabling secure, federated access to applications using SAML
  - Enabling Cisco employees and partners to log in just once to access shared applications
To read the entire case study, or for additional Cisco IT case studies on a variety of business solutions, visit Cisco on Cisco: Inside Cisco IT
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