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The Role of Cisco SONA in Enterprise Architecture Frameworks and Strategies

A White Paper by:

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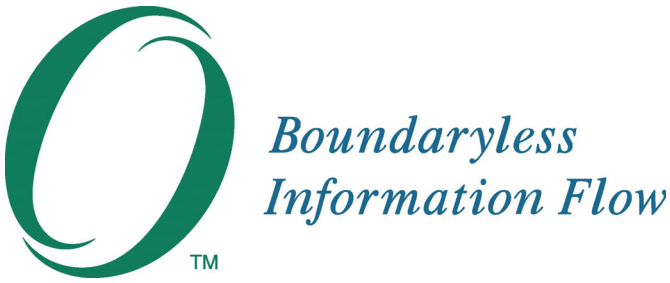

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Executive Summary

As enterprise IT architects and software systems developers consider how to implement a comprehensive enterprise IT architecture for the coming years, many are considering using several industry architecture development frameworks, including The Open Group Architecture Framework (TOGAF). Developed by The Open Group, TOGAF has been created as a standard architecture development framework that is available freely to any organization wishing to develop an information systems architecture for use within their organization.

SONA is a conceptual framework that illustrates how, when built upon a resilient network foundation, network-based services such as security, mobility, and application delivery can be leveraged by applications to enable innovative business solutions.

This White Paper presents an overview of Cisco SONA and the role it plays in enterprise IT architectures such as that defined by TOGAF.

SONA Overview

SONA adopts an architectural approach to connecting network-based services with applications to deliver business solutions.

The Cisco Service-Oriented Network Architecture (SONA) adopts an architectural approach to connecting network-based services with applications to deliver business solutions. This approach focuses first and foremost on establishing a suite of application-centered design principles that define and characterize a flexible and resilient networking environment, which foundationally provides an integrated platform for business services. Using SONA elements and principles in conjunction with Cisco Validated Design (CVD) guides, network architects and engineers can deliver services-capable communications infrastructures that are reliable, scalable, secure, predictable, and can be replicated easily for simplified deployment. A network built on SONA principles and elements can enable and optimize the delivery of applications even in today's complex network environments.

Additionally, the SONA framework shows how application architects and developers can make use of network-based capabilities exposed via public APIs to deliver services, functions, and data to the application and middleware layers of their enterprise architecture. These interfaces into the network allow application architects to leverage information sources and services not previously available in order to better meet business requirements through innovative solutions.

Three Technology Layers

SONA comprises three technology layers (see Figure 1). The Network Systems layer consists of foundational network designs and related essential services that create basic building blocks for the network infrastructure. This layer provides a sound technical blueprint for designing network modules or building blocks that can deliver flexibility, security, resilience, scalability, and performance.

The next layer up in the SONA framework model is the Integrated Network Services layer. This layer establishes guidelines to enable, accelerate, and optimize applications deployment. Integrated Network Services can be categorized into two general service types – transparent services and exposed services. Transparent services can be used to accelerate or optimize the manner in which applications run across the network, and are characteristic of transport-type services. Transparent services operate in a manner that is transparent to application-level functions and systems.

Some examples of transparent services include:

- Dynamic routing
- Switching and VLANs
- Server load balancing
- MPLS and MPLS VPNs

- Network Firewalls
- Intrusion Detection System (IDS) and Intrusion Prevention System (IPS)
- Wide Area Application Services (WAAS), such as Payload Compression
- XML Firewalls and Content-based Routing
- Email Spam and Virus Protection

Exposed services are designed to interact with application-level systems by providing accessible interfaces in the form of APIs and published protocols.

It is the exposed services that can allow enterprise network architects and software systems developers to tap into the information, state, and visibility of the network for services and data not readily available from other systems. These services can return information or trigger the performance of actions within the network, and can be accessed through external systems and software through the public interfaces.

Some examples of systems with exposed services currently available are:

- Wireless/mobility location services (using APIs)
- Integrated services router IVR scripting (using TCL)
- Network admission control (using EAP, API, HCAP)
- Authentication, authorization, and accounting (using RADIUS, HCAP, XML)

By leveraging these transparent and exposed services, an enterprise can use the network as a platform to optimize the delivery of applications and to access in-network data or state information to better address business requirements.

For example, a software developer who is creating an application that is dependent on location information of people or resources could use the SONA Mobility Location Services (using the API) to pull real-time location information directly from the network; in essence treating the network as a service provider for location data. By using SONA in this way, the software developer gains direct access to information without having to engage in additional systems development or integration with a separate location service or sub-system.

Because the integrated network services are designed to be non-specific to application implementation but customizable for optimization of generic standards-based systems – such as TCP/IP, XML, HTTP, among others – the same SONA-based network can be used to help enable and optimize the delivery of applications for traditional Enterprise Application Integration (EAI), Service-Oriented Architecture (SOA), and web services environments.

SONA comprises three technology layers:

*The **Network Systems layer** consists of foundational network designs and related essential services that create basic building blocks for the network infrastructure.*

*The **Integrated Network Services layer** establishes guidelines to enable, accelerate, and optimize applications deployment.*

*The **Application layer** represents application systems typically operating as connected entities, both physically and logically, to the network infrastructure.*

The final layer in the SONA model is the Application layer. This layer represents application systems typically operating as connected entities, both physically and logically, to the network infrastructure. These applications act as the "consumers" of the network services, both transparent and exposed. While Cisco produces a number of systems that operate at the Application level, systems in this space are also currently developed and delivered by Cisco ecosystem partners and various other third-party vendors. SONA application systems developed by Cisco work in conjunction with the network and its services through tight couplings and interfaces in order to deliver end-to-end systems-based solutions, such as Cisco Unified Communications or TelePresence. Application-level systems produced by Cisco also provide service interfaces for additional integration with third-party vendors, ecosystem partners, and end users to create additional application-level functionality. Some examples of currently available application-level services include:

- Unified Communications Directory Access (with AXL/XML/SOAP)
- Unified Communications Click-to-Dial
- IP Phone Web Services (using XML/HTTP)

By building a network as outlined by the SONA framework, an enterprise can simultaneously meet its current network and communications infrastructure needs, while investing in a services platform that will, in the long term, be an integral part of a comprehensive enterprise IT architecture.

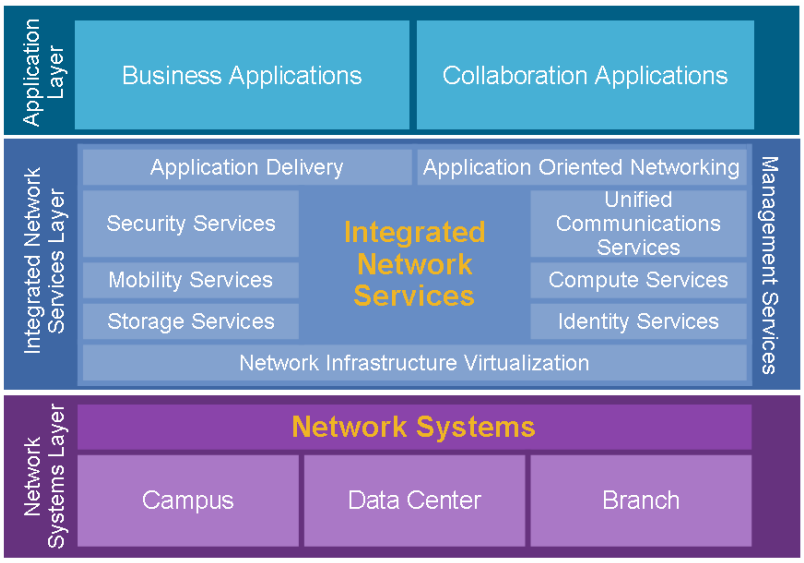
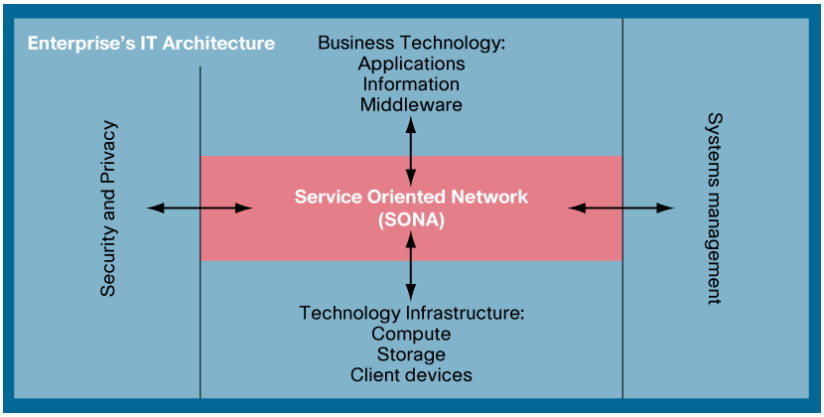


Figure 1: The SONA Framework: High-Level View

The Role of SONA in Enterprise IT Architectures

The SONA model outlines how a flexible, services-oriented communications network can be built, and identifies the high-level relationship and interfaces between the network and general application-level systems. As a result, the SONA framework is not intended as a comprehensive enterprise IT architecture framework and should not be used to supplant or considered as a substitute for a more inclusive high-level enterprise architecture, such as The Open Group Architecture Framework (TOGAF). (For more information on TOGAF, visit www.opengroup.org/togaf.) Instead, SONA should be used to provide structured design guidance at all appropriate stages within an enterprise's overall architecture process.

Figure 2: Relative Contextual View of SONA within IT Architecture



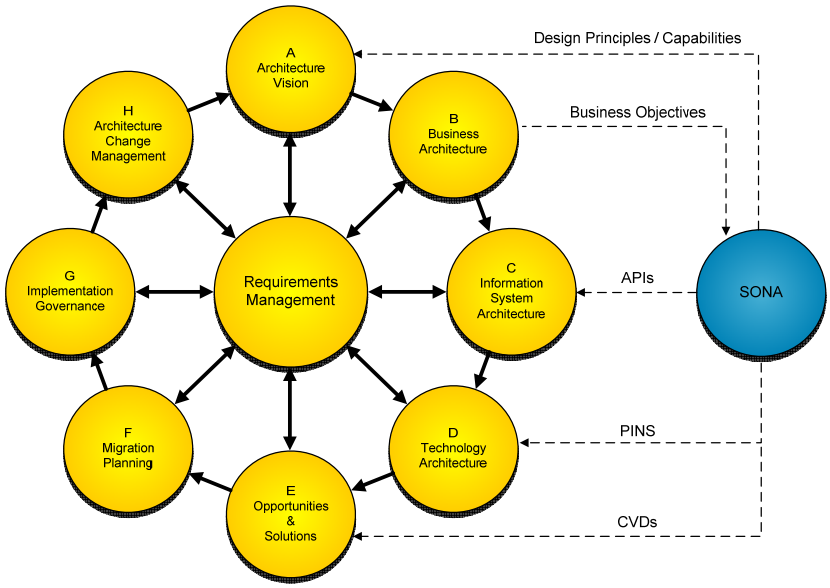
Using TOGAF as an example, it is clear that the SONA framework can be applied as a component of the TOGAF Architecture Development Method (ADM) cycle to provide a structured basis behind the decision and design processes surrounding the Technology Architecture phase (see Figure 3). In this case, TOGAF does not specify specific design methodologies for the communications infrastructure, but rather references other existing architectures such as SONA Places in the Network (PINs) and Cisco Validated Designs (CVDs).[1] Additionally, architecture frameworks typically revolve around creating systems that can be replicated easily. TOGAF recommends this approach by providing guidance on developing a building block approach that is suited to replication.[2] PINs are highly modular and provide the details of a structured, pre-tested, predictable network design. Also, the TOGAF ADM model does not outline the detailed specific interactions or interfaces between the information systems and the communications infrastructure, which are depicted at a high level. This is an area where SONA can contribute to the options available to the enterprise network architect. By providing interfaces and APIs to specific services accessible within the network, the architect can expand the service

[1] See Step 2 of the TOGAF 8.1 specification: "Consider different architecture reference models, viewpoints, and tools."

[2] See Step 3 of the TOGAF 8.1 specification: "Create an architectural model of building blocks."

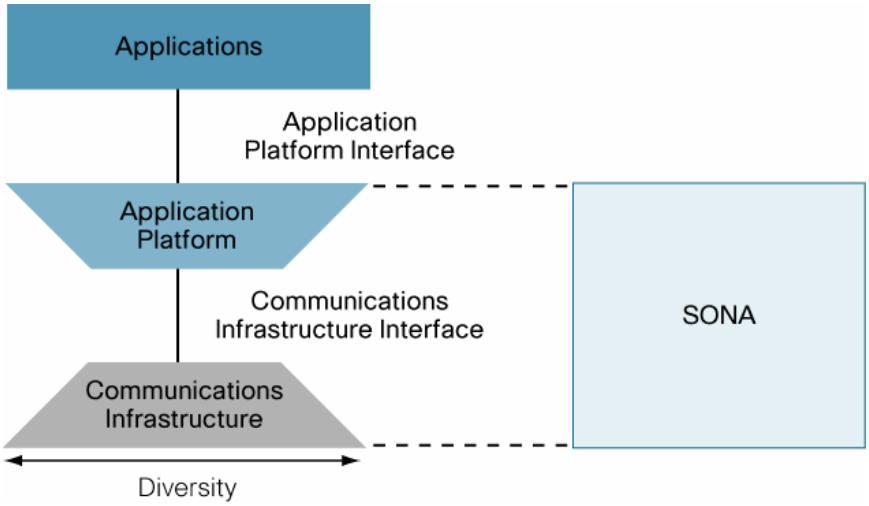
and data-source options that are useful in designing systems and solutions to address business-level requirements.

Figure 3: SONA as a Contributing Component in the TOGAF ADM



While SONA capabilities and design principles should be considered during the Architecture Vision phase of the TOGAF model, SONA PINs and CVDs can be used as a sound starting point to implement the TOGAF Technical Reference Model (TRM), a detailed model focusing on application software, application platforms, and communications infrastructures (see Figure 4).

Figure 4: SONA in Relationship to the TOGAF TRM (High-Level View)

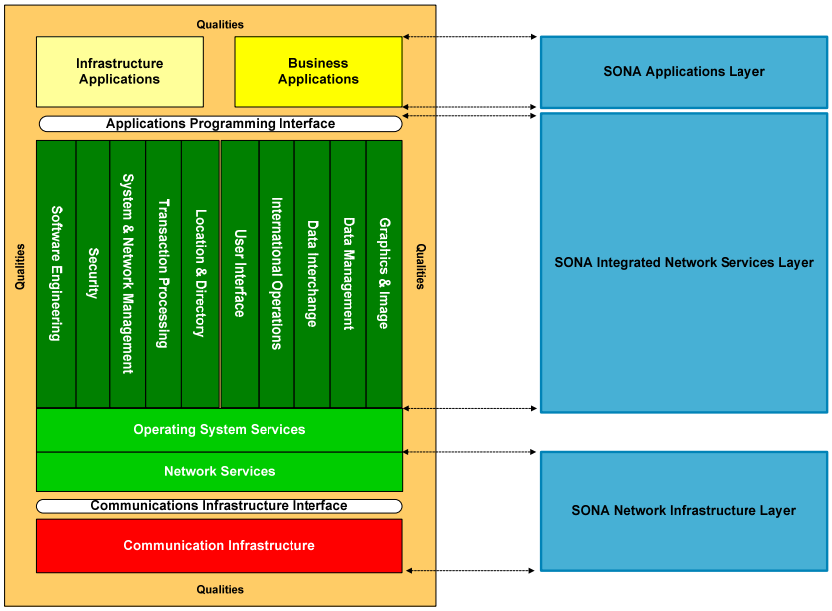


The PINs focus on network-layer design and network services places in alignment with the TOGAF TRM high-level model of representing the "Communications Infrastructure" with its services, service interfaces, and APIs as a subset that contribute to the development of the "Application

Platform", which in this case partially resides in the network in the form of its services.

At a more detailed level, SONA CVDs can provide the structured details to a solution for the TRM "Network Services", "Communications Infrastructure Interface", and "Communications Infrastructure" subsections (see Figure 5). This alignment between SONA and the TOGAF TRM allows TOGAF practitioners to jumpstart their network architecture by using a model that meets the basic requirements of a business communications infrastructure in a pre-tested, highly flexible, modular framework and also accommodates longer-term growth through integrated network services. But SONA can encompass much more of the TOGAF TRM. By providing accessible network-based services through interfaces and APIs, SONA also provides a wider view of service options for consideration in the overall systems design. This allows portions of SONA to be applied at the "Services" and "Application Programming Interface" levels of the TOGAF TRM, as required, thereby enabling the use of information and services that may not have previously been an option.

Figure 5: SONA in Relationship to the TOGAF TRM (Detailed View)



An example, which was mentioned briefly earlier in this White Paper, is the use of SONA's Location Services, a feature of the Cisco Mobility Solution that can be accessed through published interfaces to provide location and state information to external applications systems. This could allow a software developer to pull real-time location information for a network-connected entity directly from the network, treating the network as a service provider for location data. By using a SONA-based network as the service platform, an enterprise network architect can potentially produce the information and results required of a location service or sub-system without the need for additional systems development or integration.

Building and Deploying SONA

The following key components guide the use of SONA from conceptual design to deployment:

- **The SONA framework model and vision:** The high-level SONA view, which provides the guiding principles of a Service-Oriented Network and describes the interfaces and relationships between SONA elements (Applications, Interfaces, Services, and Places in the Network, or PINs).
- **Cisco Validated Designs (CVDs):** Deployment guide documents that describe, in detail, how to build a particular PIN in order to realize SONA attributes. Cisco produces two categories of CVD, each depicting a different perspective on SONA deployment.
    - PINs that detail the design and configuration of specific network subsection areas (such as campus, branch, or data center)
    - Industry architectures that use the PIN designs, combined with services and application-level integration, to deliver industry-specific, business-level, SONA-based network solutions

Network domain architects can build SONA networks by using the CVDs for the relevant PINs and implementing the necessary or selected services. These services can then be applied to and integrated into existing or new applications as needed for a more customized solution. The CVDs allow the structured and tested construction of service-capable network modules. They are the foundation to enabling access to SONA services, whether currently available or developed in the future. With the guidance provided by the SONA service data sheets, enterprise network architects can plan a domain-level network architecture capable of enabling, optimizing, and enhancing the delivery of enterprise applications.

Alternatively, for medium-sized businesses that want the benefits of a SONA network, but may not have the in-house resources necessary for internal development of a fully customized environment, the SONA Industry Architectures present a valuable end-to-end, pre-designed, and pre-tested solution option for most industries. Because all businesses differ slightly, the SONA Industry Architectures present finished designs that can be deployed as presented or additionally customized as needed.

With SONA, enterprise architects and network domain architects can select from a building-block approach to enhance the implementation of their overall architecture strategy.

More information on Cisco SONA can be found at www.cisco.com/go/sona.

About the Author

Ian Foo is a Technical Leader in Cisco's Data Center Technical Marketing Engineering team. In this role, he focuses on the impact and value of the network, network services, and network-based business solutions with respect to enterprise and application architecture strategies. With just over 12 years of industry experience in both enterprise and service provider environments, Ian brings with him a background in enterprise systems architectures, application architectures, network operating systems, application and network security, large-scale IP routing, and large-scale data center design.

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