

Open Network Registrar (ONR) Project

Overview: In a large-scale network of hosts, it can be difficult to set up and provision DNS and DHCP services, which provide the backbone of most networking environments. Domain Name Services make the Internet into the easy-to-navigate place it is today, by allowing users to simply remember a name such as www.google.com, rather than its Internet address of 64.233.187.99. Dynamic Host Configuration relieves system administrators of the duty of manually tracking and distributing Internet addresses to hosts on their network by allowing the hosts to get them automatically, as well as any special settings needed for proper network usage. DNS and DHCP are clearly related with DHCP supplying IP addresses and DNS providing the translation of names to IP addresses, among other things.

Although DNS and DHCP are both designed to make the end user experience more pleasant, it can still be challenging for the system or network administrator to keep track of settings, create new domains and network subnets, and manage hosts on their network in a consistent manner. Existing software such as Internet Systems Consortium's BIND and DHCP servers provide solid, dependable performance in a network environment, but more can be done to reduce errors in configuration, coordinate management and add consistency when deploying services.

For our project, we have designed and implemented Open Network Registrar (ONR), a centralized system to manage both DNS and DHCP services. While similar systems make use of a client-server model for administering services, ONR allows administrators to make changes using a web interface, regardless of their operating system, platform, or physical location. Any organization providing network services to a medium-to-large group of users can realize the benefits of a centralized interface to manage their DNS and DHCP services. The potential impact of ONR is quite far-reaching, ranging from Internet service providers, to universities, to corporations.

Details: In ONR, there are two main management sections of the web interface – DNS and

DHCP. Under each of these sections, there are options to Add and Manage domains and scopes. When adding a new domain or scope, many of the fields can be pre-populated using values from a Global Defaults section for ease of use and consistency. In the Global Defaults section, there are a set of values that rarely change, but are commonly used in the creation of domains and scopes. Having these values automatically supplied during the creation of new domains and scopes aids administrators not only in fast and easy creation, but also in the proper formatting of values.

Existing domains and scopes can also be managed in a consistent manner. To manage an existing domain, the desired name is selected from a list, which brings the user to its basic settings, as well as resource records belonging to that domain. Similarly, to manage an existing scope, the desired name is selected from a list, bringing the user to its basic settings, as well as hosts belonging to that scope. While managing a domain or scope, resource records and hosts can be added or modified. By having a common interface that manages settings in a predictable and reliable manner, downtime of critical systems due to misconfiguration can be avoided.

When changes are applied in the web interface, a daemon updates the configurations on the BIND and DHCP servers. Along with the capability of running as a daemon, the applicator script can be run manually. To keep DNS records current due to DHCP clients dynamically updating their DNS information, a zone reaper will periodically run to harvest updated zone records. The zone reaper can also assist in migrating from an existing system to ONR.

To prevent the possible introduction of bad data to the DNS or DHCP servers, any changes made are first saved to a temporary location. This allows the user to review those changes before the changes are actually incorporated into the running BIND and DHCP servers. Any erroneous changes can be deselected and will not be applied.

There is a Howto guide for each major section to assist the user in the operation of the interface. The field names in the Add and Manage sections are linked to the appropriate location within the

Howto guide. **Status:** The web interface is largely complete, with a framework for

continued development in place. There are several things that need to be finished before the system is complete. Some minimal DNS and DHCP management functionality needs to be refined and implemented; the editing and deletion of resource records, calculation of forward/reverse DNS entries, and manipulation of DHCP hosts. On the backend, while the zone reaper correctly retrieves and parses zone information, it does not yet populate the database with zone entries. The DHCP applicator still needs to be implemented, but should mimic the functionality of the DNS applicator.

Development: While developing the ONR project, we used phpMyAdmin to design the database schema as well as troubleshoot the operation of the web interface, and Microsoft Excel to design a layout for the web interface. Microsoft Visio was used to diagram the interaction between the servers, the application, and daemons, as well as the flow of the web interface.

During the development of the ONR project, we learned a great deal about web application development through the use of PHP, CSS, MySQL, and Perl. We were also exposed to the operation and management of DHCP and DNS systems, specifically, the ISC BIND and DHCP servers. We learned the importance of writing solid code and disciplining ourselves to use good programming practices. Working in a team environment enabled us to gain valuable experience dealing with shared code and learning how to adapt to different programming styles.

Conclusion: We have designed and implemented a usable and uniform interface to DNS and DHCP servers. By allowing these related tasks to be managed in a uniform manner, our system helps ease mission critical system administration tasks and prevents common misconfiguration errors that can lead to downtime. The Internet Systems Consortium's open source DNS and DHCP servers are important server applications frequently used in an enterprise environment. Our Open Network Registrar software provides a unique and important addition to the enterprise Linux platform.