A New Network for a New Company:

Network Infrastructure at Oceania Cruises, Inc.

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1.0 Introduction

1.1 Purpose of This Report

This report is intended to give the reader an analysis of a corporate network infrastructure, from a technical perspective and a financial perspective. It is also intended to show the costs and benefits of such an infrastructure, as well as provide recommendations for future improvements to the infrastructure. The company this report describes is Oceania Cruises, Inc.

Oceania's First Ship, the Regatta.

1.2 Scope of This Report

This report will review Oceania's network in as much technical detail as is possible, given the team members limited experience with communications networks. The financial costs and benefits of the network will be analyzed to the extent to which data exists for such an analysis. It will then conclude with a basic, yet comprehensive recommendation for future improvements to the network.

1.3 Description of the Firm: Oceania Cruises, Inc.

The Grand Staircase on the Regatta.

As its name implies, Oceania Cruises is a provider of cruises. Its target customers are recent retirees with large amounts of disposable income, interested in the finest vacation experiences available.

Oceania was formed in late 2002 through private investments. Frank Del Rio, CEO and President, and Joe Watters, Chairman, head the company. The company's executive offices are located at 8120 NW 53rd Street in the Doral area of Miami, Florida. The company's website is located at www.oceaniacruises.com.

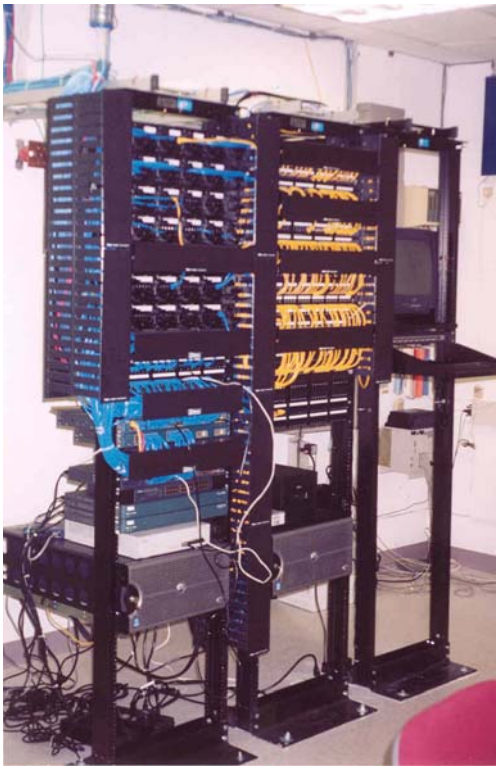
1.4 Method of Analysis

The team members visited Oceania's executive offices and inspected the network infrastructure first hand. The team also took time to speak with the Chief Financial Officer, Jose Vazquez, and the Director of Information Systems, Chris Worley. The contents of this report are based on these interviews. General information about the company was obtained from the press releases posted on the company's website.

2.0 Technical Analysis of Oceania's Network Infrastructure

2.1 General Description

Oceania's network is relatively small, encompassing about 50 users. The entire infrastructure is housed in the company's corporate office, located in Miami. Of all the services provided to the client users, only print services are actually housed at the office. All other services – web services, email services, database services – are outsourced to Innerhost, a company specializing in web hosting of



Oceania's Main Distribution Facility (MDF).

business services. All networking equipment in the office is centrally located in one room, the Main Distribution Facility (MDF).

2.2 Network Architecture

The overall network architecture is that of a rack-mounted collapsed backbone. All client computers are individually wired to the MDF, where they connect to one of several switches. The switches are then connected to a single routing switch, responsible for directing all traffic on the network. Each switch represents one Local Area Network (LAN), or subnet, and the routing switch represents the corporate backbone network, also a unique subnet.

This design allows the IT staff to accurately assess network traffic, and easily move more heavily trafficked circuits from an overloaded switch to one with less traffic. Although the physical movement between switches is quite easy, each client computer must be reconfigured whenever a circuit is moved from switch to switch.

2.3 Network Topology

The overall topology is that of a distributed star. The routing switch mounted in the rack represents the point of convergence of the central star – the backbone topology – while the switches to which all the clients are connected represent the points of convergence of the distributed stars – the LAN topology.

2.4 Servers

There are two servers connected to the network, both of which are Dell PowerEdge 2600 units. One of the two servers is designated as the primary Domain Name Services (DNS) server, while the other is designated as the secondary, or backup DNS

server. The secondary DNS server also serves as the network's print server. Both servers run Microsoft Windows 2000 Server Network Operating System (NOS). Both function as application servers for the Microsoft Office suite of office productivity applications, holding some of the application logic, while the client computers hold the remainder of the application logic.

Rack-mounted server, with backup unit above.

2.5 Clients

The client computers are mostly Dell desktops, running Microsoft Windows XP Professional Operating System (OS). Although some of the application logic is on the two servers, most, as well as the presentation logic, resides on the clients. The clients use mostly the productivity applications of Microsoft Office, as well as a web browser – Microsoft Internet Explorer, email client – Microsoft Outlook, and a specialized reservations application.

2.6 Hosted Services

Although the application logic and presentation logic resides on the on-site servers and clients, the data access logic and data storage itself reside on computers not on company premises. Innerhost provides database hosting on its computers, as well as providing email hosting on one of its Microsoft Exchange servers. Innerhost also provides web hosting for Oceania, with Oceania's public website residing on an offsite computer.

Innerhost's web server runs Microsoft Internet Information Services (IIS) web server software.

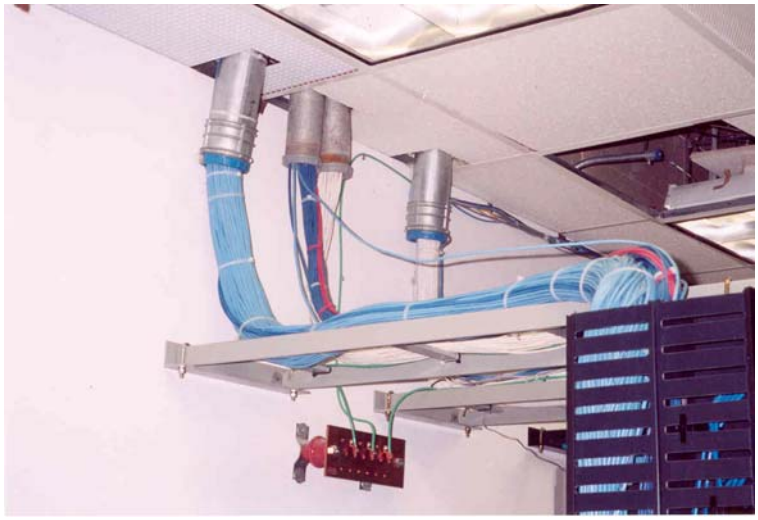
At present, Oceania does not have a corporate Intranet, so there is no call for hosting of that service.

When Oceania began operations in January 2003, the company agreed to a one-year contract with Innerhost for its hosting services. One of the IT department's primary goals is to move all the currently hosted services – web, email, and database – on to computers on the company premises.

2.7 Connections to the Outside World

Oceania's network has a relatively high demand for traffic between the network and the Internet, primarily due to the outsourced services. Presently, the network infrastructure is connected to the Internet by a leased dedicated circuit – one full T1 circuit. All services provided by Innerhost are web-based and can be accessed through this single circuit. BellSouth provides the T1 circuit, as well as the Internet access.

Oceania also maintains a dedicated circuit between its office and that of Global Marine Travel, which provide airline-booking services. This connection, an ISDN BRI circuit, is also leased from BellSouth. Global Marine Travel maintains a dedicated circuit



Cat5 cabling entering the MDF.

between its premises and that of Amadeus, one of the two major flight-booking services in the US, the other being Sabre. Oceania's access to Amadeus allows it to interact live with the real-time flight booking data.

2.8 Physical Medium

All the internal wiring on Oceania's premises consists of Category 5 twisted-pair cable (Cat5). In addition to the wires carrying data traffic being Cat5, the wires carrying voice transmissions – telephone services – are also Cat5, in preparation for future advancements in videophone technology.

2.9 Network Protocols

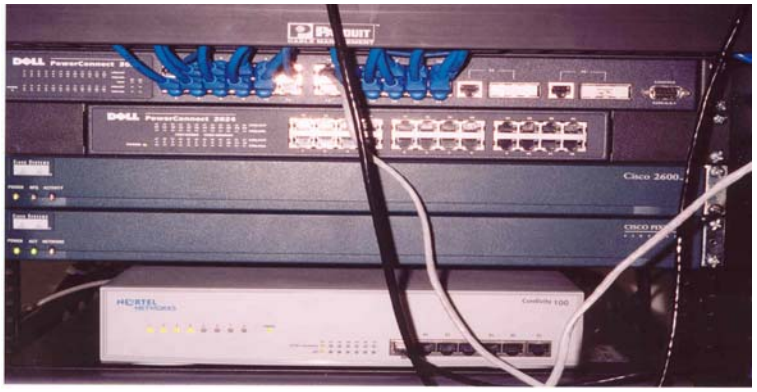
Because Oceania relies heavily on traffic between its premises and the Internet, the network protocols used had to be compatible with those of the Internet. Following the worldwide trend, Oceania chose to employ TCP/IP and Ethernet throughout its organization to facilitate its communication needs. Less translation between layer-2 and layer-3 protocols means faster network performance and higher throughput rates.

2.10 Security Measures

There are two primary security measures employed in Oceania's network. The first is an uninterruptible power supply (UPS), capable of running

A PowerWare Plus UPS, capable of supplying power for 6 hours.

the backbone, LANs, and servers for an estimated six hours. This measure is meant to maintain the integrity of the data and software residing on the servers. Unfortunately, there are no UPSs to run any of the client computers, so a power outage would pose a threat to any data stored on the clients. Fortunately, mission-critical data is stored on Interhost's database server.



A Cisco PIX Firewall, just above the Nortel Contivity 100 device.

The second security measure is a firewall, restricting access to the network from outside users on the Internet. Only a few of Oceania's client computers are visible from the Internet. Still, this is enough of a hole for a determined hacker to exploit. The firewall, a Cisco PIX series, a packet-level firewall, prevents users on the Internet from gaining access to the clients visible on the Internet.

2.11 Disaster Recovery

Because Oceania has only been in operation for less than four months, there has not been an adequate amount of time to prepare a detailed disaster recovery plan. At the moment, all of Oceania's mission-critical data is stored offsite, on Innerhost's computers. If there were a disaster, such as a hurricane, the company could easily set up a dedicated circuit in a non-affected structure and continue its operations from there. The development of a disaster recovery plans is one of the future goals identified by the Director of Information Technology.

3.0 Financial Analysis of Oceania's Network Infrastructure

3.1 Strategic Goals of the Organization

Currently, Oceania's main goal is to begin selling and delivering its product, cruise vacations, to its customers. To achieve this goal, management identified one primary directive: to become operational as fast as possible. The Oceania staff is working hard at making this a reality. Oceania cruises opened its executive offices on January 6, 2003, and began accepting bookings for its cruises on January 27, 2003. Oceania's first ship, the Regatta will make its inaugural voyage July 5, 2003.

3.2 Operational Structure

Oceania is, at the moment, a small start-up company. Although it required a considerable initial investment, the company still did not have the resources at its disposal to acquire all of the assets it would need to operate, nor to provide for itself all of the internal services it would require. Oceania's two vessels, the Regatta and the Insignia, are leased from CruiseInvest, LLC, with an option for a third ship. The deck and engine crew for each ship, the staff that operates and maintains the ship, is being outsourced, as well as the hotel and resort staff, such as housekeeping, wait staff, bartenders, etc. When the Regatta sets sail on July 5, 2003, only 20 people on board will actually be directly employed by Oceania.

3.3 Network Evolution

The company's network infrastructure grew from its need to start-up quickly. Oceania could not afford any mistakes, such as overspending on equipment and personnel, and the factors for success had to be increased. At first, management employed an

information systems consultant to get them started. The options were weighed, and it was decided to outsource most of the services commonly provided in a contemporary network infrastructure. The primary factor in the decision to outsource was the upkeep cost of all the servers needed to house the website, databases, and email system. Management determined that the annual expense related to one IT professional to administer this equipment would be equivalent to what Innerhost would charge for one year of its hosting services.

As an added bonus, when Oceania leased the offices that it now occupies, it discovered that a rack structure, complete with patch panels and cabling conduits, already existed in a centralized room. This room easily became the organization's MDF, center for all technology and equipment. Contractors were brought in to lay the Cat5 cable from each network device (client workstation, printer, etc.) back to the MDF. This layout allowed the rack-mounted collapsed backbone architecture to take shape, rather than having to spend more on network devices, such as extra hubs or switches to be placed at every cluster of clients. The expenses associated with the startup of the network included mainly the cost of the cable, as well as the cost the networking hardware – a few switches, a routing switch, a firewall, a UPS – and the servers and clients.

Eventually, one of the individuals brought in as a systems consultant, Chris Worley, was brought on-board as the Director of Information Systems.

3.4 Strategic Goals of the Network

The Director of Information Systems has identified two primary goals he sees for the network infrastructure: 100% uptime and virus-free operation. Through these two goals, the IT department can continue to provide its users, company employees, with the

ability to increase productivity, whether that increase comes from processing bookings more efficiently, reconciling accounts more efficiently, or getting a marketing piece to press more efficiently.

3.5 Information Technology Budget

Because Oceania's resources are directed at becoming operational as soon as possible, there is not much to spend on Information Technology. Most of the first year's IT budget was consumed by the startup requirements of the network. This was the primary reason for going the outsourcing route for the above-mentioned services. At this time, there is a small resource budget for any software or hardware needs that might crop up, as well as a modest emergency fund, should any disasters render the current infrastructure inoperative.

3.6 Employment Details

There are approximately fifty individuals working for Oceania Cruises now, all of whom are based out of the executive office in Miami. The IT department has two members, Chris, the Director of Information Systems, who was interviewed by the project team members, and Danny, the Network Administrator. Both members of the IT department are on the go from the moment they get to work to the moment they leave, since they are the only two employees to deal with all technology-related issues.

3.7 Network Benefits

Although the benefits of the network are largely intangible and difficult to identify, some can be more readily identified. Among those are: the ability of employees to be continuously connected and to share information and knowledge; the ability of IT staff to

more efficiently monitor virus activity; the ability to share printers among all users, rather than each user requiring their own printer; the benefit of having a single portal to the Internet, rather than each user requiring their own Internet connection; and last, but certainly not least, the personal productivity gains which each employee enjoys because of all the other benefits of the network.

3.8 Network Costs

Tangible costs associated with the network include the upkeep of the server and the lease expense of the communications line – the T1 circuit. The main intangible cost of the network would be the loss of productivity due to any network down time. However, the productivity benefits from the network far outweigh any productivity loss suffered during the rare network failures.

As earlier stated, all of the costs associated with the startup of the network were included in the startup budget for the entire company. The CFO is confident that the cost of the network startup will be recouped within eight months of operations.

4.0 Conclusion

4.1 Review of Purpose

This report was intended to give a technical and financial review of the corporate network infrastructure of Oceania Cruises, Inc., as well as to show the costs and benefits of such an infrastructure. This analysis was based upon the information obtained from the officers of the company, as well as from physical inspection by the team members.

4.2 Summary of Analysis

Oceania has a small, evolving network structure, with all the infrastructure and equipment centralized in one location, an MDF. The network was designed as a rack-mounted collapsed backbone to allow network assessment and balancing the traffic load amongst the switches. There are two servers, running Windows 2000 Server, which provide DNS services and print services, to the clients, which run Windows XP Professional. Email services, database services, and web hosting are provided to the company by an outside firm, Innerhost. These services are accessed via the Internet, to which Oceania's network is connected by a dedicated T1 circuit. All wiring in the network infrastructure is Cat5, and TCP/IP and Ethernet protocols are used throughout. The network infrastructure is protected from outside access by a packet-level firewall, and is protected from power outages by a UPS. At this point in the evolution of the network, there is no disaster recovery plan.

The network has evolved quickly, due to the present need of the company to become operational. The main driving force behind the current network structure is the need to reduce the risk of failure, which includes keeping capital expenditures on assets low. This colored management's decision to go the outsourcing route for web hosting, email, and database services. At present, the IT budget is not a priority in the operations of the company, so there is only a small cushion for any unforeseen needs. The IT department is composed of two individuals, the Director of Information Systems and the Network Administrator, both of whom work diligently to attain the two goals of the network: 100% uptime and virus-free operation. Most of the benefits of the network are intangible and difficult to identify, but most relate to the personal productivity of the employees. The

tangible costs of the network can be more readily identified, including the upkeep of the servers and leases of the dedicated circuit. According to payback analysis, the network should have paid for itself within eight months of solid sales.

4.3 Recommendations to Oceania

There are three recommendations the team can make to Oceania at this time: bring the currently hosted services in-house, form a disaster recovery plan, and monitor the capacity of the switches. Although the hosted route made financial sense from the outset, going forward the monetary benefit of hosting may no longer outweigh the indirect costs of hosting. The organization is paying a firm outside its control to provide services, and there may come a time when the outside firm cannot devote the resources to keep Oceania's services in operation. If the servers on which Oceania's data reside fail, Innerhost's employees may not work as hard to correct the issue as Oceania's employees would. This in turn would cause downtime and loss of productivity.

The second recommendation is to form a disaster recovery plan. The importance of having a well-defined plan in case of emergencies cannot be emphasized enough. If a disaster, such as a hurricane or fire that destroyed the offices, were to befall the company, what should be done? First, the organization's mission-critical data must have a backup. This is currently accomplished by having the data kept offsite, but once the services are brought in-house, a backup solution will have to be developed.

The last recommendation the team can make is to continuously monitor the switches. These switches could become bottlenecks for network traffic, and throughput could suffer, causing lost productivity. If the switches become more congested, the IT staff may need to look into the possibility of adding another switch to spread out the load

more evenly. It is very important that network traffic be switched efficiently across the LANs and BN.

Because of Oceania's size at the moment, the team cannot recommend any large changes. The current network structure will serve the company through the first few years of the company's existence, the only exceptions being those outlined above.

4.4 Benefits and Costs of Recommendations

The benefits of these recommendations are several-fold. First, bringing the hosted services inside will allow for more efficient administration of that data, as well as easier and more secure access to it. Second, it will decrease the likelihood of lost productivity: if the company's connection to the Internet fails, the users will be able to continue working. Third, a workable disaster recovery plan will set everyone's mind at ease that, should a disaster strike, the company is ready to take it in stride, with only the slightest loss in productivity. Last, making sure that network traffic flows freely will ensure that each employee is getting the maximum productivity from their network services.

The costs of such recommendations would include the cost of bringing the hosted services in-house, the cost of a backup solution, and the cost of any additional switches needed. To bring the hosted services on-site, the company would need to acquire three servers, one each for web hosting, email, and database, as well as a switch for these servers, thereby creating a server farm. There is also the possibility that one or two servers could provide the needed services. A backup solution might include several tape backup devices, or contracting with an outside service to provide off-site backup. If future network traffic warrants, more switches will need to be acquired.

Oceania's second ship, the Insignia.