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| Modification Overview | The goal of this guide is to help answer technical questions that will drive the design and configuration of the Radiation Oncology Network.  This will help the customer maximize performance of VMS software and hardware products over the network while increasing productivity within the Radiation Oncology Department.  Additionally, this document defines the division of responsibility between the Customer’s IT organization and Varian Medical System’s installation and service organizations. |

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GENERAL INFORMATION

Read this entire document, carefully reviewing all instructions.

PERFORMANCE CHECK

Complete a thorough performance verification before disassembling and modifying any system. Make a note of any operational discrepancies.

SAFETY PROCEDURES

Become familiar with Customer Support Service’s safety policies before working on Oncology Systems Products. Ensure compliance with CSS’s safety practices and procedures while performing this modification. Refer to the Product Users’ Manual for safety instructions.

CONTACT INFORMATION

If there are any questions, issues, or concerns contact Varian at 1.888.VARIAN.5 (1.888.827.4265) or go to http://my.varian.com and click on Contact Us.
CONTENTS

1. Introduction ........................................................................................................................................... 5
   1.1. Who should read this document? ........................................................................................................ 5
   1.2. Objective ............................................................................................................................................. 6
   1.3. Division of Responsibility .................................................................................................................. 6

2. Network Configuration Examples ........................................................................................................... 7
   2.1. ARIA Oncology Information System LAN Example ........................................................................ 8
   2.2. ARIA OIS WAN with VPN Example ................................................................................................ 12
   2.3. ARIA (OIS) Cloud Services VPN solution ..................................................................................... 14

3. LAN Design and Configuration ................................................................................................................ 17
   3.1. Networking Hardware ....................................................................................................................... 17
   3.2. Network Interface Controllers .......................................................................................................... 18
   3.3. Wireless Networks, Interface Cards and Access Points ................................................................. 18
   3.4. Cabling ............................................................................................................................................. 18
   3.5. VMS Software Protocol .................................................................................................................. 18
   3.6. IP Address Requirements .............................................................................................................. 19
   3.7. Mission Critical Devices ................................................................................................................ 19
   3.8. Operating Systems .......................................................................................................................... 20
   3.9. Workgroup, Active Directory and NT Domain Concept ............................................................... 20
   3.10. Name Resolution ............................................................................................................................ 21
   3.11. 3rd Party Oncology Software ....................................................................................................... 21
   3.12. Data Protection and Privacy .......................................................................................................... 21
   3.13. Administration Rights .................................................................................................................... 22
   3.15. Remote Access ................................................................................................................................ 22
   3.16. Operating System Support, Microsoft Critical Updates (Hot fixes) and Service Packs Policy ...... 22
   3.17. Citrix Thin Client Software for Radiation Oncology ................................................................... 22

4. Campus and Wide Area Network Bandwidth Requirements ................................................................... 23
   4.1. Campus ............................................................................................................................................ 23
   4.2. WAN - Overview ............................................................................................................................... 23
   4.3. WAN – Technologies ....................................................................................................................... 23
   4.4. WAN – Capacity Planning ............................................................................................................... 24
   4.5. WAN – Varian Transfer Times ....................................................................................................... 25

5. Varian Radiation Oncology Therapy Glossary ....................................................................................... 30

6. Glossary of Networking Terms ............................................................................................................... 34

7. Reader Comment Form: .......................................................................................................................... 37

8. CUSTOMER DOCUMENTATION......................................................................................................... 38
LIST OF FIGURES

Figure 1: Example LAN (ARIA OIS) ........................................................................................................................................... 8
Figure 2: CAMPUS (ARIA OIS CAMPUS EXAMPLE – WITH REMOTE DATA CENTER) ........................... 10
Figure 3: WAN/VPN (ARIA OIS) EXAMPLE MULTI-SITE .................................................................................................. 12
Figure 4: ARIA OIS CLOUD VPN SOLUTION ...................................................................................................................... 14

LIST OF TABLES

Table 1: Transfer Time, In Seconds (s), or Minutes (min), For A Patient’s Treatment ................................. 25
Table 2: At 100Mbps 0 msec latency ................................................................................................................................. 26
Table 3: At 20Mbps 30 msec latency ................................................................................................................................ 26
Table 4: At 20Mbps 45 msec latency ................................................................................................................................ 27
Table 5: Transfer Times for Eclipse Treatment Planning System ................................................................................. 27
Table 6: Transfer Time, In Seconds (s), or Minutes (min), For Single Images ......................................................... 28
Table 7: Transfer Time, In Seconds (s), or Minutes (min), For A Sample Patient ......................................................... 29
1. INTRODUCTION

The purpose of this document is to address Network Designs and Configurations that will help our customers successfully integrate Varian Medical Systems (VMS) software products into new or existing Customer Enterprise Networks.

The goal of this guide is to help answer technical questions that will drive the design and configuration of the Radiation Oncology Network. This will help the customer maximize performance of VMS software and hardware products over the network while increasing productivity within the Radiation Oncology Department. Additionally, this document defines the division of responsibility between the Customer’s IT organization and Varian Medical System’s installation and service organizations.

It is critical to understand the interdependency that exists between VMS software products and the Customer-provided Networking Environment. Most integrated VMS software products are Client Server applications that access one common database. These Client Workstation products and Linear Accelerator products in Treatment Areas can access multiple databases located on centralized servers via the network provided by the customer. Interruptions in connectivity, or slow, overloaded, or high latency WAN links to these databases via the customer-provided network, will affect both the radiotherapy patient treatment planning process as well as treatment delivery, with its record and verify process.

Customer-provided Radiation Oncology Network over LAN, Campus, WAN and Cloud Service VPNs

The customer-provided Radiation Oncology Network should always be considered mission critical in the overall safety and treatment of the patient, as well as the daily operation of the Radiation Oncology Department. For the purpose of this guide, mission critical devices are defined as any device that can stop the Radiation Oncology Department from treating patients or interfere with the record and verify process.

The mission critical network and the ARIA Oncology Information System (OIS) software are used for 2 primary tasks. The first task is the treatment planning and imaging process. This is done with software products such as Eclipse and Radiation Oncology applications. It is important to understand that a large volume of images are used in this process. It is also important to understand that a single patient may have more than one proposed treatment plan. Therefore, a single patient may create multiple volumes of image sets. The ARIA OIS software also performs administrative data management tasks, the treatment delivery process, and the record and verify process. It also provides historical patient information as well as charge capture.

1.1. Who should read this document?

This paper is designed for Radiation Oncology Information Technology (IT) Support Managers, Network Engineers, IT Administrators, and technicians responsible for designing, installing, configuring, and maintaining the network.

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1.2. Objective

The objective of this document is to provide our customers’ Information Technology hospital network engineers and those responsible for maintaining Radiation Oncology networks with the minimum required specifications for their network. Meeting these specifications will optimize performance, significantly reduce the likelihood of network congestion, and ensure success with treatment planning and the record and verify process. Most importantly, optimizing network performance prevents disruptions to the most important and most critical aspect of the Radiation Oncology process: patient treatment.

1.3. Division of Responsibility

When it comes to network design, maintenance of networks, configuration, etc., there are usually some installation and implementation concerns as to who is responsible for what. To ensure a trouble-free project, good communications between the customer, vendors, third party contractors, and Varian is essential. In addition, defining typical areas of responsibility for each party can help focus efforts in an effective manner.

With respect to the Clinac and Simulation products provided by Varian, Varian provides all the equipment and software. A detailed discussion of this equipment, and the software supplied with this equipment, is outside the scope of this paper.

With respect to the ARIA OIS, which is used in conjunction with the Clinac and Simulation products, Varian typically supplies and installs only the Varian specific software applications. Varian also provides training services for this software. In general, the customer, or one of its vendors, supplies and installs the necessary computers, operating system software, and network components.

The hardware and software specifications for the ARIA OIS Servers and Workstations are available on the Varian Web site. For additional information, please refer to the following Web pages:

http://www.varian.com/us/oncology/services_and_support/hardware_specifications/

Computer equipment and operating system software can also be purchased from Varian as an option. The customer is responsible for the installation of this equipment.

The planning, installation, and on-going support of the Radiation Oncology Department network and its associated hardware, software, and maintenance are always the responsibility of the customer.

The products Varian installs, and then completes Acceptance with the customer, are normally covered by Varian’s Warranty. Once out of Warranty, the ongoing Maintenance Contract, which the customer enters into with Varian, will define the responsibility of Varian’s level of support.

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1 Varian is not responsible for the design or installation of networks
2 Varian is not responsible for network maintenance. Maintenance contracts can be provided at additional cost. See your salesperson.
In North America, in the event that a “turnkey” network project is expected from Varian, a clear scope of work and additional cost estimates should be established ahead of time and must be so indicated on the Customer’s purchase order. Please refer to the VMS Standard Terms and Conditions of Sale and VMS Software Schedule for any specific responsibilities that are typically provided by Varian. A customer/site specific VMS Master Professional Services Agreement, with one or more Statements of Work, may be entered into by Varian and the customer, to define additional and/or unique responsibilities for both Varian and the customer.

2. NETWORK CONFIGURATION EXAMPLES

In this section there are four examples of different network configurations that typically exist with respect to the Radiation Oncology Department or Clinic. These are Local Area Networks (LAN), Campus, Wide Area Networks (WAN) and cloud Virtual Private Network (VPN) environments. The location of the ARIA OIS servers has a major influence on the network requirements and design. The placement of the ARIA OIS servers is shown in the 4 Network examples in this guide. All four network configurations are examples of current Varian customer networks.

Figure 1, Figure 2, Figure 3 and Figure 4 show LAN, Campus, WAN and cloud VPN network configurations that include the linear accelerator and ARIA OIS. This guideline also specifically addresses client applications such as the Eclipse Treatment Planning System and Medical Oncology. Lastly, the network requirements in this guide for the ARIA OIS servers are also applicable to the Comprehensive Cancer Solution (CCS) as the Medical Oncology database is integrated with the ARIA databases on the ARIA OIS servers.

It is recommended that all readers of this Guideline read the discussion following Figure 1, and then move on to the Campus, WAN and Cloud VPN examples. The Clinac Control area of Varian Treatment is installed and maintained by qualified Varian service personnel.

Varian has overall responsibility for the software installation and configuration as noted by the areas that have a white background in Figures 1-4.

The customer has overall responsibility for the installation and support of the areas in these Figures that have a gray background. The customer, and/or the Customer’s vendor, also has the responsibility of providing network drops for each of the cables that route out of the gray area to the white background areas.

The customer has no responsibility outside of the gray area in Figures 1-4.
2.1. ARIA Oncology Information System LAN Example

Figure 1: Example LAN (ARIA OIS)
Figure 1 is a generic representation of ARIA OIS in a hospital LAN. In this scenario, the division of responsibility for the Customer's IT department starts with the Switch and the network cables (in the gray shaded area), which lead out to the Clinac Network Interface Device (CNID). The demarcation point is the CNID.

The hospital's IT department is also responsible for connections to the hospital's LAN backbone and routers, as well as the Radiation Oncology staff's general purpose PC workstations, printers and peripheral devices that may also be connected to the edge switch. The workstation may have various Varian software applications installed if a Thick Client environment is implemented.

In this scenario, Varian is responsible for installing and configuring the Varian software for the Linear Accelerator(s), Acuity Simulator, and any control nodes located in the control areas of these modalities. In addition, ARIA client software will be installed by Varian on selected Citrix servers that have been configured as part of the Radiation Oncology network.

The hospital enterprise network may consist of several Varian Clinac products, each with its dedicated Varian Treatment Network (VTN) and CNID. The hospital's TCP/IP network terminates at the CNID. The hospital's TCP/IP network also terminates at the CNID located in the Acuity Simulator as well as at the ARIA OIS Servers. Shown in Figure 1 are individual ARIA OIS servers or the optional ARIA Full Scale appliance.
Figure 2: CAMPUS (ARIA OIS CAMPUS EXAMPLE – WITH REMOTE DATA CENTER)
Figure 2 is an example representation of ARIA in a hospital enterprise Campus environment. Again, note the division of responsibility for the Hospital IT department starts directly with the network switches, cables and interfaces that connect to the CNID. The ARIA OIS or optional Full Scale appliance is located in the Customer’s Data Center.

The IT department’s responsibility also includes the network routers to the hospital network and backbone. Finally, the Hospital IT department is responsible for the backbone that connects the various network switches that interconnect the Radiation Oncology Network, which in this example includes fiber optic connections between the main hospital, a remote facility, and a remote Data Center. The hospital enterprise network may consist of several Varian Clinac products, each with its dedicated CNID. Each facility may contain many workstations that are thick or thin clients of the ARIA OIS.
2.2. ARIA OIS WAN with VPN Example

Figure 3: WAN/VPN (ARIA OIS) EXAMPLE MULTI-SITE
The third network configuration, as shown in Figure 3, is called the WAN environment. This type of configuration is the most complicated environment.

In this example, there is a Main Hospital Facility represented in the upper part of the figure, along with three Remote Facilities. The Data Center is in the lower part of Figure 3.

The division of responsibility is the same as with the LAN and Campus examples.

As with the first two configurations, Hospital IT responsibility starts directly at the switches and includes the cabling that connects to the CNID (note, this is not shown in Figure 3). Hospital IT responsibility has increased to include not only the interfaces from the switches and the network backbone, but also the routers (in most examples). In this example the Telco circuits are leased from multiple WAN providers. Typically Smart Jacks and other Telco equipment are serviced and maintained by the Telco. This is why there is no shaded gray area in Figure 3. From a Varian point of view all Network infrastructure equipment is the responsibility of the customer.

It is recommended that the Hospital IT departments receive Service Level Agreements (SLAs) from WAN product providers to ensure all parties mutually agree to the level of service.

At the minimum, each of the Remote Facilities would be on a separate subnet from the subnet that defines the Radiation Oncology Network in the Main Facility.

Varian recommends that the customer avoid certain types of high latency WAN technologies such as Satcom and Frame Relay. Multiple hops over WAN links can cause delays even when the bandwidth is not fully utilized.
2.3. **ARIA (OIS) Cloud Services VPN solution**

**Cloud Solution**

![Diagram of ARIA OIS Cloud Services VPN Solution]

*Figure 4: ARIA OIS CLOUD VPN SOLUTION*
In this example all ARIA OIS servers and applications exist in the Cloud. The Clinac and simulator modalities exist locally with their respective control applications. There may also be more than one remote facility each with a separate VPN connection over the Internet to the Cloud provider. Citrix thin clients are a requirement in this configuration. The following is a list of requirements for the Full Scale Cloud infrastructure:

- **Tier 1 Network Provider:** Tier 1 provider for connection to FullScale™ Cloud. The U.S. Tier 1 providers are listed below for reference:
  - AT&T
  - Verizon Business
  - Sprint (Softbank Broadband)
  - CenturyLink (Formally Qwest and Sawis)
  - Level 3 Communications (with Global Crossing)
  - NTT (Formally Verio)

- **Bandwidth Requirements (per site)**
  - 10 Mbps Symmetrical for 1st CLINAC + 5 Mbps Symmetrical for each additional CLINAC

- **Latency:**
  - <50ms Recommended (80ms Maximum)

- **Virtual Networking:**
  - VPN using IPSec protocol
  - MPLS Cloud +VPN – (Please contact Varian if this is being considered)

The recommended WAN link for each remote facility to the internet is 10Mbs for the first Linear Accelerator on site and 5Mps for each additional Clinac product. The remote link from the internet to each satellite facility must be leased from a Tier 1 provider to ensure the lowest possible amount Latency. Latency should be 50ms or less for best performance up to 80ms maximum in this configuration. The customer and Varian’s Cloud Services provider are responsible for all Networking and VPN configuration.

**VTN Information**

The hospital enterprise network may consist of several Varian Clinac products in multiple locations throughout the enterprise, each with its dedicated Varian Treatment Network (VTN).

1. The VTN segment extends from the concrete vault where the Linear Accelerator is located into the Treatment Control Areas and terminates at the CNID. The hospital’s TCP/IP network also terminates at the CNID.

2. All VTN Nodes are connected to the Varian Treatment Network, using Network Interface Cards. Varian uses the IP subnets 172.20.20.0/24 and 172.22.22.0/24 for the Varian Treatment Network. These subnets are behind a Network Address Translation (NAT) boundary and are not routed to the Hospital Network.

3. The VTN connects all internal nodes of Varian’s Clinac, Trilogy, and True Beam linear accelerator products. A similar Varian Network may be installed in work areas that include Acuity Simulators. As these Varian Networks evolve, changes to the design of these networks, which are the sole responsibility of Varian, may occur without prior notice.
Varian will maintain the Varian Network segments in the Treatment Rooms, from the wall outlet in the Treatment area that is connected to the Hospital Network switch to the Treatment Workstation.

1. The hospital's TCP/IP network terminates at the CNID.
2. The CNID is connected to the Varian Treatment Network.

Network Design and Configuration Requirements

The mission critical network and ARIA OIS software are used for two primary tasks.

The first task is the treatment planning and imaging process. This is done with software products such as Eclipse, and ARIA. It is important to understand that a large volume of images are used in this process. It is also important to understand that a single patient may have more than one proposed treatment plan. Therefore, a single patient may create multiple volumes of large image sets.

The second task of the ARIA OIS is treatment delivery and record and verify processes. Note that the ARIA OIS also provides historical patient information and captures billing information.

The record and verification aspect of the radiation treatment process consists of acquisition of clinical data and its transmission to the ARIA OIS servers. This interface is from the Clinac product through the VTN and CNID, connected to the Hospital network, and then passed on to the ARIA OIS database server. The reliability of Clinical data delivery requires that a robust, clean connection to the ARIA OIS database is maintained at all times.

Communications from the Clinac and Simulation products must be able to reach the ARIA OIS servers without being interrupted by network traffic congestion. Some causes of network congestion are streaming audio or video, large image transfers, and VOIP.

On a network with many devices, the broadcasts associated with their availability must also be controlled. Large flat networks are not recommended. Smaller routed subnets will provide better performance. There are many computer-generated tasks performed in modern Radiation Oncology departments and Radiotherapy Clinics. As with any system, the network must be designed and maintained properly to perform optimally.

The Radiation Oncology network, and its interface to the hospital network, must be finished and tested before the ARIA installation starts.
3. LAN DESIGN AND CONFIGURATION

3.1. Networking Hardware

3.1.1. Switch (Layer 2 or 3 Device)

Varian **requires at a minimum** the use of a 10/100Mbps Network Switch (1Gbps or better is recommended) for LAN connectivity between servers and workstations. Switches used to connect servers and workstations running ARIA OIS should have the connection ports set to Auto Negotiate speed and duplex. VMS software requires the LAN to be a completely switched environment. Network Hubs are not to be used anywhere on the Network to connect any server or workstation running ARIA OIS.

Varian **recommends** the use of a Commercial Grade Manageable Network Switch (Layer 2 or 3) for LAN connectivity. Through a management port on this type of switch, an engineer can gain useful information on the health of the network attached to it. This information can help diagnose many types of potential problems. These types of switches typically have features such as Virtual LAN (VLAN) capability that can be used to isolate the Radiation Oncology broadcast domain from other broadcast domains within the Customer’s Enterprise Network. The use of Manageable Switches and VLAN technology is not required by Varian to run Aria OIS.

All Clinac and Acuity Simulator products have an internal PRIVATE NETWORK. This Network is called the Varian Treatment Network (VTN). The installation, configuration, and management of the VTN and associated devices are the responsibility of Varian Medical Systems. This VTN should never be altered by the Customer’s IT organization.

3.1.2. Routers

A router can also be used to isolate the Radiation Oncology Network broadcast domain from other broadcast domains within the Customer’s Enterprise Network. ARIA OIS makes use of the TCP/IP protocol only; other protocols such as IPX/SPX are unwanted. A router can filter out non-IP traffic not intended for the devices on the Radiation Oncology Network. In WAN environments, similar to the one shown in Figure 3, routers are needed to connect the different segments of the Radiation Oncology Network. The installation, configuration, and management of the Customer-provided Network devices are the sole responsibility of the Customer’s IT organization.

3.1.3. Servers and Workstations

It is **required** that all mission critical devices running VMS software have Network Interface Cards (NIC) that support at least 100Mbps full duplex operation (Gigabit NICs or higher are recommended). NIC teaming and redundant NIC configurations can be implemented by the Customer’s IT organization via NIC vendor software on a single Virtual IP address. Specialized configurations using Link Aggregation Protocol (LACP) are the sole responsibility of the Customer’s IT organization to manage and configure.
3.2. Network Interface Controllers
The minimum capability of a Network Interface Card (NIC) is required to be 10/100Mbps (10/100/1000Mps NICs are recommended). The NIC should be set to Auto-Negotiate speed and duplex. Speed and duplex settings should be checked after Auto-Negotiation occurs to ensure that speed and duplex settings match on both ends of the connection. Some NICs and Ethernet Switches don’t Auto-Negotiate properly. In circumstances where Auto-Negotiation does not function properly, check the Internet for an updated NIC driver first. If the driver for the NIC is current, then it may be necessary to force both ends of the connection to 100 or 1000Mps Full Duplex.

3.3. Wireless Networks, Interface Cards and Access Points
The use of Wireless devices fall well below VMS minimum network specifications for use with Mission Critical Devices and cannot be used in these devices. Customers may choose to use Wireless Devices with non-critical, administrative laptops and tablet Personal Computers. VMS makes no claims or warranty as to the safety or efficacy of ARIA OIS, when using these Wireless Devices.

3.4. Cabling
It is the Customer’s responsibility to install, terminate, and test all network cabling and patch panel connections prior to any VMS software installation, unless it is explicitly included in the Varian sales contract. All physical layer Network Cable and connectors should be a minimum of Category 5 or better.

Varian recommends the Customer choose a cable installation contractor familiar with government regulations for the Customer’s locality. Also a good contractor will “Certify” each network drop and provide documentation for this. Varian is responsible for the connection between the wall outlet, Varian Servers, Mission Critical Devices and Workstations. (See 3.7 for a definition of Mission Critical.)

3.5. VMS Software Protocol
All VMS software products make use of the TCP/IP protocol suite. In a Customer’s Enterprise Network there may be multiple protocols such as NETBEUI, DECNET, APPLETAALK and IPX/SPX. Associated with each protocol in use, there will be broadcast traffic generated and propagated around the network. Varian recommends that the customer eliminate all unnecessary protocols. Varian requires subnets for the TCP/IP protocol in order to reduce the number of broadcast messages that must be processed by Mission Critical devices connected to the Radiation Oncology network. The subnet of the Radiation Oncology Department should be kept as small as possible, preferably a Class-C subnet. Large flat TCP/IP networks running broadcast-intensive software will adversely impact the performance of VMS software products. Varian also recommends isolating the Radiation Oncology broadcast domain from the Enterprise Network. This should and can be done without losing connectivity back to the Enterprise Network. VLANS and/or the use of routers are both good ideas.

In a WAN environment, different subnet address ranges should be assigned to each portion of the Radiation Oncology network, with the various subnets being connected by the hospital’s routers and WAN circuits. See Figure 3 in Section 2.2 for an example of such a network environment.
3.6. IP Address Requirements

When integrating VMS software into an existing Customer’s Enterprise Network, the customer must supply an IP address range to the Varian Installation Engineer. If the Customer-provided Network is new and no IP addresses are provided the Varian Installation Engineer will use a Class C private address range (e.g. 192.168.1.x/24). For functional and reliability reasons, all Mission Critical hardware is required to have static IP addresses. All other non-mission critical workstations can use Dynamic Host Configuration Protocol (DHCP) in a managed environment.

3.7. Mission Critical Devices

ARIA OIS, Clinac, and Simulation products are considered Medical Devices. The software consists of many different functions that keep the Radiation Oncology Department treating its patients on a daily basis. Patients might miss critical treatment opportunities if Treatment Planning or the Record and Verify functions are interrupted due to a network failure or a computer failure.

Mission Critical devices are Medical Devices. The Mission Critical servers and workstations that keep Radiation Oncology treating patients must not be managed the same way that a Customer’s typical Enterprise File Server or a generic workstation is managed. For example, Enterprise-wide Microsoft Windows Policies pushed out over the network to all workstations should NOT be pushed to any Medical or Mission Critical Device. Also, the Customer’s standard software packages that are installed throughout the Enterprise Network on typical servers and workstations should NOT be installed on any of the following Varian Mission Critical Devices (see section 3.11 3rd Party Software):

Mission Critical Devices:

- All Varian Servers – including
  - Varian ARIA (OIS) System Database Server
  - ARIA (OIS) OSP/WEB/RIA Server
  - ARIA (OIS) Image File System Server
  - ARIA (OIS) Information Exchange Manager (IEM) Interface Server
  - ARIA (OIS) MedOncology Database Server (Standalone)
- 4D Integrated Treatment Console and On-Board Imager (OBI) Workstations
- Acuity Workstations
- VI, AVI, LVI, TVI Computers on the Varian Network – including
  - PortalVision Workstation
  - Clinac Console
  - CBCT Reconstruction Computer
  - MLC Workstation
  - Respiratory Gating Workstation
- XimaVision Computers
- SomaVision Workstations
- Treatment Planning Systems workstations such as Eclipse (Windows)
• Product Specific Computers – including
  • BrachyVision Workstation
  • Variseed Workstation
  • GammaMed Workstation
  • VariSource Workstation

In addition, the Customer-provided Network and associated hardware and software which provide connectivity between Varian Mission Critical Devices are also to be considered Mission Critical Devices. The Customer-provided Network, supporting the Varian Mission Critical Devices, and providing connectivity between the Varian servers and the Varian workstations, and the Varian Network, should have as few layer 3 hops as possible.

3.8. Operating Systems

VMS software systems run on Microsoft Windows platforms. Each VMS software application version has passed quality assurance validation testing with a particular version and configuration of the Windows Operating System. Varian submits this testing data to the FDA to demonstrate the safety and efficacy of the Medical Devices. The configuration of the tested Windows Operating System and VMS software shall not be altered in any way as this voids the FDA provided platform-dependent clearance. Please check with Varian for the latest qualified Operating Systems for a particular VMS software application running on a qualified medical device. For additional information, please refer to the following Web pages:

http://www.varian.com/oois/its005.html

3.9. Workgroup, Active Directory and NT Domain Concept

In order for a user to execute VMS software applications the user authenticates to a Workgroup, or an Active Directory. VMS software is designed ideally to run in an Active Directory (AD) or a Windows Workgroup (<5 workstations and servers). ARIA OIS can be setup to run in its own AD, or it can be integrated into the Customer’s existing AD. The Varian Document “ARIA Security Implementation Guide” contains details on this topic.

If the customer does not have an existing AD and there are more than 5 workstations and servers, the Varian Installation Engineer will choose a VMS server as a Domain Controller, and may choose to perform initial set up of the AD infrastructure to facilitate installation of Varian Software. Please note that Varian Installation Engineers can NOT provide on-going support for the environment, and this is best relegated to a local dedicated IT professional or professionals that are provided by the Customer.

Please note that a Workgroup installation environment is difficult to manage and is not recommended as a good installation environment choice. Windows workgroups do not take advantage of centralized resource management features found in Windows AD, such as central management of users, groups, and authentication. Generally, a Windows workgroup can be considered as a collection of stand-alone client or stand-alone client and stand-alone server machines, each individually managed and maintained but who are configured to loosely associate with one another. Each machine choosing to advertise itself under the same collective Windows networking group name achieves this loose association.
3.10. Name Resolution
Name resolution is critical to the overall performance of VMS software systems. Varian recommends the Customer’s Enterprise Network environment provide Dynamic Domain Name Systems (DNS). Varian also requires lookups function in both forward and reverse directions. If AD is operating in Mixed Mode and NetBIOS names are used, then a Windows Internet Name Service (WINS) server should also be configured in the Customer’s Networking Environment. If the Customer does not have any of these services, then the Varian Installation Engineer can set up DNS. In North America, this is an additional cost to the customer.

3.11. 3rd Party Oncology Software
Any installation of 3rd party software not referenced in Varian’s FDA 510(k) submission falls outside the scope of the 510(k) clearance. Therefore, Varian does not market or sell products for such use and makes no claims or warranty as to the safety or efficacy for use of such products on any Mission Critical Device. The customer may have a need for 3rd party software on administrative workstations in Radiation Oncology that are to have VMS client software installed. These workstations are not Mission Critical and do not affect 510(k) clearance. It should also be noted that it is the Customer’s responsibility to test all 3rd party applications along with VMS software applications prior to installation to ensure software compatibility on administrative workstations.

For the policy about the usage of Anti-Virus software please consult: http://www.myvarian.com

Varian Medical Systems does not guarantee the coexistence of VMS software with any non-VMS software. It is the Customer’s responsibility to test for proper function of the VMS software after any modifications on administrative workstations. If any incompatibility is observed, then the 3rd party software must be removed, by the Customer, to insure the proper function of the VMS software.

3.12. Data Protection and Privacy
The Health Insurance Portability and Accountability Act (HIPPA) of 1996, says that all data on patients must be kept secure and private. It is each VMS Customer’s responsibility to ensure HIPAA regulations are met.

It is Varian’s intention to secure all Patient Data from un-authorized access within Varian software applications. There are many different possibilities with regard to implementing security in a networked environment.

Varian has established a “Security Implementation Guide” to adapt to the different Hospital environments. This document explains the different concepts Varian supports as a standard. It will also explain all supported concepts in detail and will be updated to fit the needs of new software releases and to all supported Operating Systems.

Varian differentiates between database access security and file security. All Patients data is stored in a Sybase or Microsoft SQL Server Database, depending on the version of ARIA OIS software that is installed at the Customer’s location. Applications and Images are stored in files on the server’s hard disk and workstation local hard disks.

Access to Patient data within databases is restricted through user and group security. Each Practice Management and Radiation Oncology client application requires a valid login and password, which has individual access permissions to the Patient’s data enforced by the application. The Database Management System protects against direct database access. The applications, documents and images are protected through Windows file security. The details are explained in the Security Implementation Guide.
3.13. Administration Rights
For any type of installation, upgrade, or troubleshooting, temporary Domain Administrator rights or Local Administrator rights, such as for non-Varian Domain Controllers, shall be granted to the VMS Field Engineer. It is impossible to perform installation, troubleshooting and routine service tasks without administrator rights. Also, special consideration needs to be made as these tasks typically take place after normal working hours when regular IT presence is minimal, and IT may not be able to provide the needed support to the Varian Installations Engineer.

3.14. Physical Access
VMS field Engineers must have 24 hour physical access to all equipment for any type of service to take place.

3.15. Remote Access
The VMS remote access product for troubleshooting purposes is called “Smart Connect”. It is the standard remote access tool used by all of VMS service for remote troubleshooting over the Internet. Varian does not support Customer-provided remote access tools. This becomes impossible given the sheer number of different tools that may be used by our Customers worldwide. Smart Connect Remote Access provides the Customer with faster response times for problem solving by VMS technical support personnel. Smart Connect was developed by Varian using Axeda® technology.

Typically, the Customer initiates Smart Connect connections from their systems to VMS. It does not provide for entry into a Customer’s Network without the customer initiating the connection first (unless it is configured to do so). Smart Connect is secure and meets HIPPA standards. It uses an ever-changing high encryption algorithm called “Blowfish”. Details can be found in the Smart Connect documentation, “Smart Connect Installation and User Guide for Customers” and “Smart Connect Information Packet for Customers”. Smart Connect is provided free of charge to customers with service contracts.

3.16. Operating System Support, Microsoft Critical Updates (Hot fixes) and Service Packs Policy
It is Varian’s policy that Customers are responsible for the security and protection of their networks. Customers are responsible for maintaining current virus protection, robust firewalls, and Microsoft Critical Updates. If customers have defects in their network security, it is possible for their Varian products to become infected with viruses.

For additional information, please refer to https://myvarian.com for the Microsoft Updates policy and the Anti-Virus policy.

3.17. Citrix Thin Client Software for Radiation Oncology
For customers who wish to publish ARIA Client software to the desktop using Citrix please refer to Citrix Supplement to ARIA Customer Release Notes P/N 100029908-01. The use of Citrix thin client software does not change the LAN, WAN and Campus recommendations and requirements set forth in this document.
4. **CAMPUS AND WIDE AREA NETWORK BANDWIDTH REQUIREMENTS**

4.1. **Campus**

VMS software integration into a Campus area networking environment is common at Universities and Cancer Centers where the VMS servers are remotely located in a server farm. Single mode and Multi-mode Fiber may be used to connect each facility on the campus to form the backbone of the Network. Please see Figure 2. In this environment, bandwidth typically exceeds 10/100 Mbps LAN speeds. The Customer’s Network Engineer should be made aware of the new Network load that will be added to the existing Network load. Careful attention and proper planning should ensure a successful integration.

What must be considered in this environment is automatic secondary links, to be used for disaster recovery purposes. This is because Campus environments are prone to constant construction activities and the breaking of a fiber optic link is a risk to the Mission Critical network requirement.

4.2. **WAN - Overview**

VMS software products will successfully integrate into new or existing WAN infrastructures. Please see Figure 3. Varian does not recommend integration into existing over-utilized or over-subscribed WAN infrastructures. Integration into existing WAN environments that are over-utilized may result in poor performance and software timeouts. Varian recommends that the customer avoid certain types of high latency WAN technologies such as Satcom and Frame Relay if possible. Multiple hops over WAN links can cause delays even when the bandwidth is not fully utilized. The end user who is unaware of the WAN status may observe poor performance, even when there is bandwidth available. This could occur, for example, due to high latency across multiple hops, leading to the network not being utilized properly. It should also be noted that end users are not always aware of the difference in software performance over a WAN link vs. LAN performance.

4.3. **WAN – Technologies**

There are many different types of WAN technologies available today. The number of choices for a WAN depends on the location of the sites being linked together. It is important to understand that in most major metropolitan areas there are usually a wide variety of choices for WAN such as MPLS, Frame Relay, T1/E1, DSL, Cable, Dark Fiber, ATM, DS-3, T3/E3, SONET, OC-48. In rural locations, WAN choices will be limited.

Virtual Private Networks (VPNs) are sometimes used to connect remote facilities using the Internet as the connection medium. VPN connections are not the same as private leased lines, point to point circuits, or a Private Virtual Connection (PVC) through a frame relay cloud. VPN connections use the public Internet to transport private data traffic from one location to another. This requires Encryption methods and Authentication methods to keep patient data secure. Encryption algorithms can also add to latency within the VPN connection, causing poor software performance. Customers must consult HIPPA regulations concerning VPN connections prior to using them.

Some common examples of WANs supporting VMS software are listed below.

- Multiple T-1s configured for PPP Multilink
- ATM connections supporting 10Mbps and 100Mbps
- SONET rings OC-12 and OC-48
• Dark Fiber Connections
• MPLS Clouds supporting 768Kbps to 45Mbps – note the possibility of high latency issues with the use of Frame Relay
• Microwave connections up to 11Mbps

4.4. WAN – Capacity Planning

Customers using ARIA and ECLIPSE (TPS), High Availability and Rapid Recovery Protection (HARRP), and 3rd party applications over WAN links must scale the WAN link bandwidth to accommodate this additional load. System performance must also be a consideration in determining the proper amount of bandwidth needed between facilities. The minimum required bandwidth listed in this document is only a baseline starting point for the customer. It is also the point at which the software may timeout between the Varian System Server and the 4DITC Workstation. To ensure end users are happy with the software performance from a remote facility, the WAN infrastructure must be properly designed, configured and scaled to accommodate the entire WAN load.

Imaging software and Treatment Planning Systems can place a tremendous load on a WAN infrastructure. It is important to understand high network utilization over a short period of time, commonly called “network spikes”. Network spikes usually occur during image transfers. While average network utilization time averaged over a 24 hour period may seem low, network spikes that occur during treatment operations can affect system performance at the treatment console. The WAN infrastructure must be designed with enough bandwidth to compensate for the network spikes during hours of patient treatment and/or treatment session planning.

1. Utilization averaged over the eight-hour workday shouldn’t exceed 20%.
2. Average utilization during the busiest single hour of the day should not exceed 30%.
3. Average utilization during ANY 15 minute period of the workday should not exceed 50%.
4. Utilization spikes of 80% or higher should not exceed 2 seconds in duration.

An example of a “network spike” would be the movement of a patient’s image file from a Treatment Planning System server, over a single T-1 link, to a remote Treatment Planning workstation. For example, a network spike of 3 to 4 minutes could occur if an image file of 30M Bytes was sent over a 1.5Mbps T-1 link. To allow radiotherapy treatment to continue on this same T-1 link through this period, with patient data moving between the Varian System server and a Mission Critical 4DITC workstation, network techniques such as Quality of Service (QoS) should be implemented to provide priority service to the radiotherapy network traffic.
4.5. WAN – Varian Transfer Times

It is important to understand that the values below are examples and can vary from site to site, depending on the connection, and possible latency issues that are site specific. They are intended to give an estimate of how long it takes for the data and images to be transferred via different WAN connections.

4.5.1. Transfer Times for Treatment Plans

The table below shows the tested, approximate transfer time for different types of Treatment Plans over different portions of a T1 circuit. This is the time to transfer the Treatment Plan from the database on the Varian System server to the 4D Integrated Treatment workstation, by selecting the patient from the ARIA Queue application. These measurements were made with release 6.5 using compressed files, which is the standard installation practice. These measurements also apply to ARIA.

Therefore, the minimum requirement for a remote site with a single Linear Accelerator, ARIA, and no imaging is 384Kbps (6 channels of a T-1). The 384Kbps is a minimum and it does not include a Linear Accelerator with Portal Vision installed. The 384Kbps minimum also does not cover any existing 3rd party applications like Internet, email or Hospital Information Systems. The 384Kbps requirement applies to any WAN technology used. The second row of each Plan shows the increase in the transfer time that occurs if an additional load of 1,000Kbps is placed on the channels dedicated to the Treatment Plans. This additional load could be Varian applications such as Radiation Oncology, or Eclipse; or it could be 3rd party applications.

<table>
<thead>
<tr>
<th>Type Plan</th>
<th>Content</th>
<th>Non-Treatment Load</th>
</tr>
</thead>
<tbody>
<tr>
<td>IMRT</td>
<td>200 segments and 18 fields</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1,000 Kbps</td>
</tr>
<tr>
<td>IMRT</td>
<td>200 segments and 18 fields, plus patient photo and two setup photos</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1,000 Kbps</td>
</tr>
<tr>
<td>IMRT</td>
<td>200 segments and 18 fields, plus reference image/DRR and 3 previous portal images for two fields</td>
<td>None</td>
</tr>
<tr>
<td>Static MLC</td>
<td>6 fields, plus reference image/DRR for two fields and 3 previous portal images for each of the 6 fields</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1,000 Kbps</td>
</tr>
</tbody>
</table>
The following tables show tests that were performed using the ARIA 11 Treatment Application. The purpose is to show the effects of Latency on transfer times from the ARIA OIS servers into the 4DITC console.

### Table 2: At 100Mbps 0 msec latency

<table>
<thead>
<tr>
<th>Test Patient ID Number</th>
<th>Description</th>
<th>Plan</th>
<th>Download Time</th>
<th>Save back Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>13-088</td>
<td>Course Test 18 IMRT Fields (Unusual Extreme Case)</td>
<td>1A Pelvis</td>
<td>18Sec</td>
<td></td>
</tr>
<tr>
<td>13-054</td>
<td>Head Neck IMRT 9Fields</td>
<td>1A Tongue LN</td>
<td>14Sec</td>
<td></td>
</tr>
<tr>
<td>13-026</td>
<td>7 Field IMRt Prostate</td>
<td>A-Pelvis</td>
<td>12Sec</td>
<td></td>
</tr>
<tr>
<td>08-022</td>
<td>non-IMRT 4 field Pelvis</td>
<td>1APelvis</td>
<td>6Sec</td>
<td></td>
</tr>
<tr>
<td>13-143</td>
<td>IMRT 2 fields</td>
<td>1A L BR F in F</td>
<td>10Sec</td>
<td></td>
</tr>
<tr>
<td>13-189</td>
<td>AP PA Spine</td>
<td>L1-S2</td>
<td>4sec</td>
<td>20 sec</td>
</tr>
</tbody>
</table>

### Table 3: At 20Mbps 30 msec latency

<table>
<thead>
<tr>
<th>Test Patient ID Number</th>
<th>Description</th>
<th>Plan</th>
<th>Download Time</th>
<th>Save back Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>13-088</td>
<td>Course Test 18 IMRT Fields (Unusual Extreme Case)</td>
<td>1A Pelvis</td>
<td>1min 12</td>
<td></td>
</tr>
<tr>
<td>13-054</td>
<td>Head Neck IMRT 9Fields/W CBCT</td>
<td>1A Tongue LN</td>
<td>46sec</td>
<td></td>
</tr>
<tr>
<td>13-026</td>
<td>7 Field IMRt Prostate</td>
<td>A-Pelvis</td>
<td>35sec</td>
<td></td>
</tr>
<tr>
<td>08-022</td>
<td>non-IMRT 4 field Pelvis</td>
<td>1APelvis</td>
<td>18sec</td>
<td></td>
</tr>
<tr>
<td>13-143</td>
<td>IMRT 2 fields</td>
<td>1A L BR F in F</td>
<td>23sec</td>
<td></td>
</tr>
<tr>
<td>13-189</td>
<td>AP PA Spine</td>
<td>L1-S2</td>
<td>13sec</td>
<td>1Min 23Sec</td>
</tr>
</tbody>
</table>

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Table 4: At 20Mbps 45 msec latency

<table>
<thead>
<tr>
<th>Test Patient ID Number</th>
<th>Description</th>
<th>Plan</th>
<th>Download Time</th>
<th>Save back Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>13-088</td>
<td>Course Test 18 IMRT Fields (Unusual Extreme Case)</td>
<td>1A Pelvis</td>
<td>1:35</td>
<td></td>
</tr>
<tr>
<td>13-054</td>
<td>Head Neck IMRT 9Fields</td>
<td>1A Tongue LN</td>
<td>1:01</td>
<td></td>
</tr>
<tr>
<td>13-026</td>
<td>7 Field IMRT Prostate</td>
<td>A-Pelvis</td>
<td>45sec</td>
<td></td>
</tr>
<tr>
<td>08-022</td>
<td>non-IMRT 4 field Pelvis</td>
<td>1APelvis</td>
<td>25sec</td>
<td></td>
</tr>
<tr>
<td>13-143</td>
<td>IMRT 2 fields</td>
<td>1A L BR F in F</td>
<td>33sec</td>
<td></td>
</tr>
<tr>
<td>13-189</td>
<td>AP PA Spine</td>
<td>L1-S2</td>
<td>15sec</td>
<td>2:03</td>
</tr>
</tbody>
</table>

4.5.2. Transfer Times for the Eclipse Treatment Planning System

Table 5 shows the tested, approximate transfer time for different task steps associated with Treatment Planning. Because the volume of data is so large, a full 24 channels of a T1 circuit is considered to be the minimum bandwidth between the Eclipse workstation and the Eclipse server. These measurements were made with Eclipse server 7.1, and Eclipse workstation 7.3.

Table 5: Transfer Times for Eclipse Treatment Planning System

<table>
<thead>
<tr>
<th>Task Steps over T1 WAN</th>
<th>Static MLC</th>
<th>IMRT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prostate Plan, 246 slices (Axial CT Images), 10 Fields, 10 DRRs (for Static MLC only)</td>
<td>MB Moved</td>
<td>MB Moved</td>
</tr>
<tr>
<td>1. Import images from Mini PACS attach images and auto save</td>
<td>130</td>
<td>130</td>
</tr>
<tr>
<td>2. Create 3D volume and send to Workstation, creation of contour, insertion of plan fields</td>
<td>65</td>
<td>65</td>
</tr>
<tr>
<td>3. Static – Calculating Dose, or IMRT - Optimize and LMC</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>4. Move Plan to Eclipse (SA) Server, export Plan to Varian System Server</td>
<td>30</td>
<td>30</td>
</tr>
</tbody>
</table>

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4.5.3. Transfer Times for Radiation Oncology Images

Tables 6 and 7 show the approximate transfer time for different image types via the most commonly used WAN connections. The calculations are based on a 70% load of the bandwidth, which is reasonably optimistic. Furthermore, it may be required that some of the bandwidth on this WAN circuit be reserved for the 4DITC, to ensure connectivity to the Varian System server during treatment.

<table>
<thead>
<tr>
<th>Table 6: Transfer Time, In Seconds (s), or Minutes (min), For Single Images</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bandwidth Available</td>
</tr>
<tr>
<td>Dedicated Portion of a T1 Link</td>
</tr>
<tr>
<td>Image Type</td>
</tr>
<tr>
<td>CT/ MR/ DRR</td>
</tr>
<tr>
<td>XimaVision</td>
</tr>
<tr>
<td>PortalVision Lic 250</td>
</tr>
<tr>
<td>PortalVision aS500</td>
</tr>
<tr>
<td>PortalVision aS1000</td>
</tr>
<tr>
<td>PaxScan Half Resolution</td>
</tr>
<tr>
<td>PaxScan Full Resolution</td>
</tr>
<tr>
<td>CBCT Slice</td>
</tr>
<tr>
<td>Cone Beam CT</td>
</tr>
</tbody>
</table>
Table 7 shows the load of an entire patient including all images. The values are for a patient having 2 Plans, 4 Fields for each plan, 30 fractions (6 weeks), 2 verification images per week and field.

<table>
<thead>
<tr>
<th>Amount of images</th>
<th>Size</th>
<th>512Kbps</th>
<th>1.5Mbps</th>
<th>34Mbps</th>
<th>155Mbps</th>
</tr>
</thead>
<tbody>
<tr>
<td>80 CT/ MR</td>
<td>40 MB</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 DRRs</td>
<td>4 MB</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16 Sim</td>
<td>32 MB</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100 PV Lic 250/aS500</td>
<td>13 / 38 MB</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total for the Patient</td>
<td>89 / 114 MB</td>
<td>35 – 45 min</td>
<td>10 – 15 min</td>
<td>30 – 40 s</td>
<td>6 – 9 s</td>
</tr>
</tbody>
</table>
5. **VARIAN RADIATION ONCOLOGY THERAPY GLOSSARY**

**Acuity**

The Acuity System combines planning, simulation, and motion data for verifying patient plans. High-resolution, interactive 2D digital images enable precise, efficient planning. Auto-setup of 3D planning information ensures data integrity and accurate machine setup. Respiration motion data, captured using Acuity and Varian’s RPM Respiratory Gating System, allows the system to account more accurately for patient motion.

**AVI**

See Verification Interface

** Clinac**

The Varian trademarked family of linear accelerator models used to deliver therapeutic radiation for treatment of cancer.

**Control console**

The system control unit for Clinacs and Ximatrons, which includes operator controls for starting and stopping an exposure and for mechanical alignment of the machine.

**DICOM (Digital Imaging and Communications in Medicine)**

An international standard for defining information objects associated with Diagnostic images.

**DICOM-RT**

An extension of DICOM, to support radiation oncology objects

**Eclipse**

Varian trade name for a radiotherapy treatment planning system used to plan treatments to be delivered by a device that produces a radiation beam (typically a linear accelerator). Eclipse is a Windows-based system built on the Radiation Oncology platform and includes all basic Radiation Oncology capabilities. It can operate standalone, as a distributed system over a LAN, or as a fully integrated element of an ARIA System. It has the capability to interface with external applications to import images and export treatment plans and images via DICOM.

**EOPP (Eclipse Ocular Proton Planning)**

A treatment planning application specially designed for eye treatment using a stationary proton beam.

**HARRP (High Availability and Rapid Recovery Protection)**

A software-driven technology to provide real-time mirroring, replication and failover/fallback options.

**HELIOS**

Varian trade name for a software application that performs radiation therapy for inverse treatment planning starting with a desired dose distribution to a tumor volume.

**HL7 (Health Level 7)**

A standard for electronic data exchange in healthcare environments, with special emphasis on inpatient acute care facilities.
IN ROOM MONITOR
Display monitor in the treatment room that displays the plan and actual mechanical position settings for the next field to be treated, along with the setup and schedule notes and field setup photos, if available.

MLC
Varian registered trademark for a Multileaf Collimator, that is, a set of moveable collimator leaves (52, 80, or 120) that can be positioned to conform closely to the shape the tumor presents to the beam’s eye view.

On Board Imager (OBI)
The On-Board Imager, an automated system for Image-Guided Radiation Therapy (IGRT), will enable clinicians to obtain high-resolution X-ray images to pinpoint tumor sites, adjust patient positioning when necessary, and complete a treatment, all within the standard treatment time slot.

Portal Imaging (see PortalVision)
A technique to provide electronic, megavoltage x-ray image captures during treatment. Typically used to monitor & verify treatment field setups, including beam-shaping devices, in comparison to a patient’s anatomical landmarks. Portal images perform the same function as port films without requiring film.

PortalVision
Varian trade name for a member of Varian’s Vision product family used to acquire & review portal images from a Varian Clinac. PortalVision also includes the basic Vision functions.

RV Treatment
Record and Verify Treatment; a treatment whose parameters are (a) verified against a plan and (b) recorded as history by some kind of information management system (e.g. ARIA).

ScanVision
Varian trade name for a member of Varian’s Vision product family used to acquire, reconstruct & review CT images from a Varian Ximatron. ScanVision also includes the basic Vision functions.

Simulation System
A system composed of a Simulator and an image acquisition device. Examples are Varian’s Ximatron, XimaVision, and Acuity.

Smart Connect
Proprietary Varian tool used for remote monitoring, problem diagnosis, and software upgrade for a remote system.

SomaVision
Varian trade name for a member of Varian’s Vision product family used to import images from various external sources (CT, MRI, radiographs), reconstruct & display volumetric images, define anatomical structures and tumor volumes, create DRRs (Digitally Reconstructed Radiographs), define beams for therapy, and prepare information for detailed dosimetric calculation. SomaVision also includes the basic Vision functions.
4D Integrated Treatment Console (4DITC) Workstation

Varian trade name for a system that verifies an accelerator is set up according to the treatment plan before allowing beam-on, and maintains accurate and reliable records of all treatments given on the accelerator. 4DITC workstations interface with Clinac radiotherapy accelerators.

Treatment Planning System (TPS)

A software application used to create treatment plans for radiation therapy. Modern treatment planning systems typically use CT image sets and 2D diagnostic images to define tumor volumes and critical anatomical structures that could be affected by radiation therapy. The goal is to provide a lethal dose of radiation to the tumor while minimizing the effect on healthy tissue. Examples of treatment planning systems include Varian’s Eclipse & CadPlan, ADAC’s Pinnacle, CMS’ Focus, etc.

Varian Network

The hospital’s TCP/IP network terminates at the 4DITC Workstation, or the Clinac Network Interface Device (CNID) if OBI is installed. The 4DITC and OBI Workstation are also connected to the Varian Network, on a single Network Interface Card (NIC). Other designs of Varian Networks will evolve over time, including networks to support Acuity Simulators. These Varian Networks are the sole responsibility of Varian.

The Varian Network connects the 4DITC Workstation and the OBI Workstation (if OBI is installed) to the other Varian devices that are connected directly to the Clinac, such as the Treatment Verification Interface (VI), the Multileaf Collimator (MLC) Controller, the Portal Vision (PV) Image Acquisition System (IAS), the PaxScan (Image Processing Unit), and the Cone Beam CT controller (CBCT), if installed. The Linac Verification Interface (LVI), and its In Room Monitor, has a serial connection to the Console; the Console has a serial connection to the Clinac.

Practice Management

Practice Management Clients are part of the ARIA information System. These applications are designed to unify the clinical and administrative aspects of radiation oncology.

Varian System Server

(Also Varian System Database, ARIA Database)

The Sybase or Microsoft SQL database is the central repository for all persistent Patient Data.

ARIA IEM (Information Exchange Manager) HL7

An interfacing option to the ARIA OIS that allows connection between the ARIA Database and a medical center’s HL7 based Hospital Information System. ARIA IEM is installed on a separate server and provides HL7 message filtering to select only those HL7 messages intended for the ARIA OIS, for actual transmission to the ARIA OIS.

ARIA MedOncology

This is an optional ARIA application that provides the capability to unify the clinical and administrative aspects of Medical Oncology with Radiation Oncology. Patient demographic, scheduling and clinical assessment data is shared between both radiation oncology and medical oncology activities.
Verification Interface (VI)

1. The interface software that reads the Clinac treatment settings and compares the actual settings to planned settings from ARIA.

2. The computer that contains the interface software. Varieties include:
   A. AVI – Advanced Verification Interface. Used with C-Series Clinacs only. Available for connection to ARIA OIS. Required for Auto Field Sequencing with Auto Mode-up.
   B. EVI – Extensible Verification Interface. Used with non-Varian linacs only. Available for selected models of Siemens, Elekta and GE linacs.
   C. VI – Verification Interface (also VI/IRM). Used with non-C-Series Clinacs (requires a CCX) and C-Series Clinacs (CSSI only).
   D. LinacVI – Used with ARIA OIS. It is part of the Varian Network.

Radiation Oncology Applications

A Varian software product used to view and manipulate images. It’s a client-server system, operating over a LAN. It includes a suite of Applications for imaging.
6. **GLOSSARY OF NETWORKING TERMS**

**Collision**
In an Ethernet network, a collision is the simultaneous presence of signals from two nodes on the network.

**Channel Service Unit (CSU)**
The CSU is a device that connects a terminal to a digital line. Typically, the two devices CSU/DSU are packaged as a single unit.

**Channel Service Unit/Data Service Unit (CSU/DSU)**
In digital telecommunications, the CSU and DSU are two components of a Data Communications Equipment (DCE) device. These components provide access to digital services over DDS, TI, and other types of lines.

**Domain Name System or Service (DNS)**
An Internet service that translates domain names into IP addresses.

**Data Service Unit (DSU)**
The DSU is a device that performs protective and diagnostic functions for a telecommunications line and "Telco" (telephone company).

**E1**
A digital trunking facility standard used in Europe and elsewhere, capable of transmitting and receiving 30 digitized voice or data channels. Two additional channels are used for synchronization, framing, and signaling. The transmission rate is 2048 kilobits per second. See also T1.

**Frame Relay**
Frame relay is one of several contenders for a Wide-Area Networking (WAN) standard. It is suitable for transmitting data only, not for transmitting voice or video, because these require constant transmission capabilities. Frame relay can have a bandwidth as high as 2 megabits per second (Mbps).

**Hub**
A hub is a device that serves as a common termination point for multiple nodes and that can relay signals along the appropriate paths. Hubs are hardware networking devices that operate at the physical and data-link layer of the OSI model. Hubs are designed for half duplex communication.

**Local Area Network (LAN)**
A LAN is a collection of two or more computers that are located within a limited distance of each other and that are connected to each other, directly or indirectly. LANs differ in the way the computers are connected, how information moves around the network, and what machine (if any) is in charge of the network.

**LAN Hardware**
The hardware for PC-based LANs includes computers, NICs (Network Interface Card), cables, connectors, wiring centers, safety devices, and networking communication devices.
Network Basic Input Output System (NetBIOS)

An Application-Programming Interface (API) that augments the DOS BIOS by adding special functions for LANs.

Quality of Service (QoS)

QoS refers to the capability of a network to provide better service to selected network traffic over various technologies. The primary goal of QoS is to provide priority, including dedicated bandwidth, controlled jitter and latency (required by some real-time and interactive traffic), and improved loss characteristics.

Real time

Real time refers to the performance of a computer system that receives and processes data quickly enough to produce output to control, direct, or affect the outcome of an ongoing activity or process. Real time performance of the computations is necessary to update an image or a parameter, reading quickly enough so that the image sequence appears correct and the parameter reading is current.

Simple Network Management Protocol (SNMP)

SNMP is the Internet standard protocol developed to manage nodes (servers, workstations, routers, switches and hubs etc.) on an IP network. It enables network administrators to manage network performance, find and solve network problems, and plan for network growth.

Switch

The purpose of a switch is to serve as a common termination point for multiple nodes and computers and to relay signals along the appropriate cable paths. A switch can be used to create collision and broadcast domains. Switches are hardware and software networking devices that operate at the second layer of the OSI model. Switches are designed for full duplex communication and they provide filtering of un-needed packets as well as other services not available with Hubs.

Router

The function of a router is to provide a path from a node on one network to a node on another network. The two networks may be separated by several intervening networks and, possibly, by many miles.

T1 Carrier / T3 Carrier

In digital communications, T1 is the carrier used in North America, Australia, and Japan. Although originally developed to transmit voice conversations, T1 is also suitable for data and image transmissions, and it is commonly used for such purposes. T1 has a bandwidth of 1.544 megabits per second (Mbps), which comes from 24 individual 64 kilobit per second (kbps) channels, together with one kbps framing channel. T3 communications channel has a bandwidth of 44.736 megabits per second. This channel is the equivalent of 28 T1 channels, or of 672 voice channels, each of 64 kilobits per second.

Throughput

Maximum number of packets per second a given network can support
Wide-Area Network (WAN)

A WAN is a network whose elements may be separated by distances great enough to require telephone communications. The WAN supports communications between such elements. For most WANs, the long-distance bandwidth is relatively slow: on the order of kilobits per second (kbps) as opposed to megabits per second (Mbps) for local-area networks (LANs). For example, an Ethernet LAN has a 10 or 100 Mbps bandwidth; a WAN using part or all of a TI carrier has a bandwidth determined by the number of 64 kbps channels the WAN is using, up to 24 such channels, for a maximum TI bandwidth of 1.544 Mbps (including control bits).

Windows Internet Naming Service (WINS)

A system that determines the IP address associated with a particular network computer. This is called name resolution.

7. READER COMMENT FORM:

Your input is vital to the continuous improvement for this Guideline. If you have detailed recommendations for the Guideline, please mark them directly on the document and return the redlined document to:

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Please list any other brief recommendations or comments for the Guideline below. Be as specific as possible listing paragraph numbers, headings, etc. For your convenience you may fax your feedback to PSE at 408-321-4349.

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8. **CUSTOMER DOCUMENTATION**

This document and the latest version of the instructions for user are available for download at [https://my.varian.com](https://my.varian.com).

This CTB includes new information not available in other Varian documents. Please advise the appropriate personnel working in your radiotherapy department of the content of this CTB and place a copy of this CTB with the user manuals for the affected Varian Product.
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