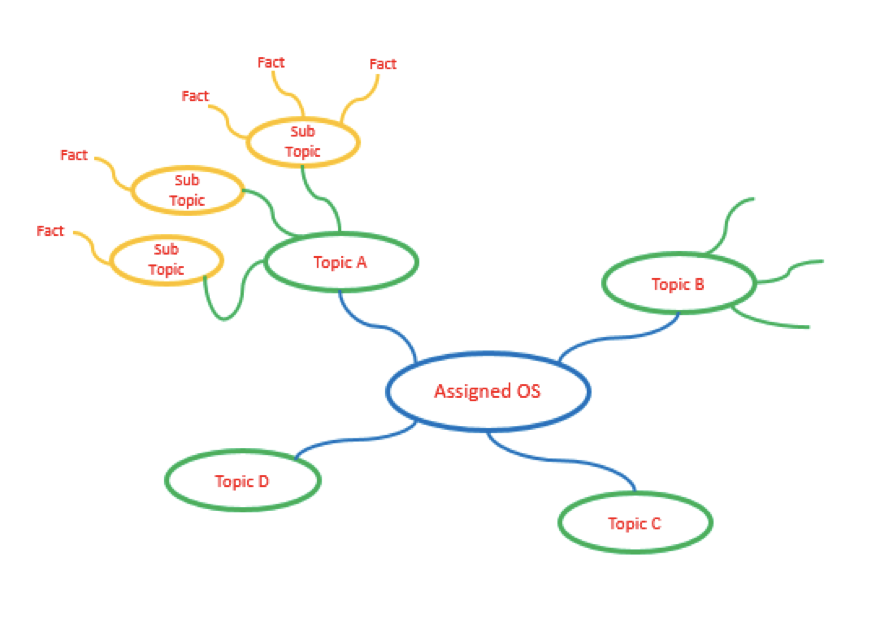
**Objectives**

1.     Research information about software for a specific operating system (OS) environment. You will be assigned one of the operating systems form the list below. You will also be provided with a list of topics to investigate.

2.     Organize your rough research information into a list of topics, sub-topics and facts. This process will involve identifying sub-topics, rearranging your rough research notes, and selecting (or highlighting) interesting facts.

3.     Report a summary of your research in the form of a  “concept map”. Use the PowerPoint template provided as a starting point. The concept map should only include the best and most interesting information from your organized research notes.

4.     Your concept map can be created using: Smart Ideas, Prezi, PowerPoint or other similar applications.



**Step 1 – Organized Research**

Research information about your assigned operating system (OS) environment.

·   Guide your research according to the suggested topic list below

·   Feel free to copy-and-paste as long as you keep track of your bibliographic references.

·   Do not be too picky or concerned about formatting as you will organize this information later in step 2

·   Select things that look interesting and don’t forget to include graphics images as well

·   Upload your rough research notes to your repository when you are done.

Topic A – Application Software

Provide a summary of most important user application software targeted by this operating system and how it is similar to and deferent from standard PC software. Suggested sub-topics include:

·   User (client) or network (server) applications

·   Batch (run without user input) or interactive (user focused) processing

·   Off-the-shelf (purchased) or custom developed applications

·   Programming environment and languages supported

BlackBerry QNX is perfectly positioned to address this software evolution with the broadest set of solutions, the expertise, and the pedigree that makes it an automotive software leader for the biggest OEM and Tier 1 brands.

The QNX Platform for Digital Cockpits enables automakers to offer a reliable and secure QNX-based digital instrument cluster and infotainment system that provides access to the latest Android-based applications such as Google Maps and Google Play Music all from a single ECU.

The QNX Platform for Digital Cockpits enables the integration of QNX, Android and/or Linux guests on a single SoC in a secure manner. To mitigate potential Android vulnerabilities for example, designed-in Android security mechanisms prevent the direct exchange of data between Android and safety-critical systems and networks such as the Controller Area Network (CAN).

BlackBerry QNX offers a safety-compliant real-time operating system (RTOS) that works in perfect unison with security, connectivity, HMI and custom hardware considerations.

The world’s largest medical device manufacturers trust BlackBerry QNX to help run their blood diagnostics, ultrasound imaging, infusion delivery, heart monitoring and resuscitation, robotic surgery, and numerous other applications.

The world’s largest medical device manufacturers trust BlackBerry QNX to help run their blood diagnostics, ultrasound imaging, infusion delivery, heart monitoring and resuscitation, robotic surgery, and numerous other applications.

BlackBerry QNX is fueling this automation and robotics evolution through software in applications like Programmable Logic Controllers that enable manufacturers to create complex connected systems that are defined by their precision, reliability and deterministic behaviour, and run non-stop and remain in-field for a very long time.

QNX® Hypervisor is a real-time, Type 1 hypervisor that offers virtualization technology for complex embedded systems in industrial automation, enabling the secure separation and isolation of operating systems on a single SoC.

Topic B – Hardware

Provide a summary of the hardware targeted by this operating system and how it is similar to and deferent from standard PC hardware. Suggested sub-topics include:

·   Speed of processors / memory

·   Capacity of memory / attached disks

·   Is it designed for home / office / corporate data center / industrial use

·   Is it designed for client / server / network use

The QNX Neutrino RTOS provides a full multi-core solution that has been deployed on multi-core processors in virtually every embedded environment. The solution offers:

- Symmetric multiprocessing (SMP)

- Asymmetric multiprocessing (AMP)

- Bound multiprocessing (BMP)

- Inherent scalability — symmetric and bound multiprocessing scale seamlessly to 4, 18, 16+ cores

- Support for a wide range of popular multiprocessor SOCs and boards

|  |  |  |
| --- | --- | --- |
|  | **Minimum** | **Recommended** |
| Processor | Pentium III, 700 MHz | Pentium 4, 2 GHz or more |
| RAM | 256 MB | 512 MB |
| Disk space | 2.2 GB | 2.2 GB |
| Monitor | 1024×768 | 1280×1024 |

A RAM disk is a storage area that exists only in memory but looks like a hard disk. You can add one to your system by using [devb-ram](http://www.qnx.com/developers/docs/6.5.0/topic/com.qnx.doc.neutrino_utilities/d/devb-ram.html), but this is a RAM disk with the overhead of a block filesystem; by default, it's initialized and formatted for an [fs-qnx4.so](http://www.qnx.com/developers/docs/6.5.0/topic/com.qnx.doc.neutrino_utilities/f/fs-qnx4.so.html) filesystem (unless you specify the **ram nodinit** option)

Who are the intended users of QNX?

* Automotive companies
* Manufacturers
* Health care facilities
* Government defence departments
* Security agencies

Who actually uses QNX?

* Acura
* Adtran
* Atomic Energy of Canada Limited
* Audi
* BMW
* BTI
* Photonics
* Caterpillar
* Chrysler
* Ciena Networks
* Cisco Systems
* Daewoo
* DragonWave
* Emerson Process Management
* Fortna
* General Electric
* GE Transportation

A better way of creating a RAM disk is to use the **blk ramdisk=...** option, which creates an internal RAM disk that io-blk.so *does* know is RAM and doesn't need to be copied via cache. It uses a 4 KB sector size.

If you already have any other devb-\* driver running, then you can simply piggyback the RAM disk on it (by adding, for example, **blk ramdisk=10m** to the invocation of that devb- driver).

Topic C – User Interface

Provide a summary of the user interface and input devices targeted by this operating system and how it is similar to and deferent from a standard PC. Suggested sub-topics include:

·   Does it support a windowed environment, command line, or network users

·   Does it support multiple users at a time or single users

·   Does it support multiple applications or a single application at a time

·   Does it get rebooted (powered on / off) or is it always on

The QNX Aviage multimedia suite consists of several packages, including the multimedia core package, codec packages that provide WMA9, MP3, and AAC decoding and encoding, and software packages that support iPod and PlaysForSure media players.

The major component of the multimedia core package is the MultiMedia Engine (MME). The MME provides the main interfaces for configuring and controlling your multimedia applications. Designed to run on the QNX Neutrino OS, which can be installed on a wide variety of hardware platforms, the MME provides consumer-product developers a component-based solution that reduces the work required to develop and deliver multimedia products to their end customers.

The MME is designed to simplify and speed development of end-user applications that require device and filesystem access, content synchronization, playback control, and audio and graphics delivery. It handles multiple clients, sessions and streams, and abstracts hardware and protocol dependencies from other functional areas. It provides integration with a wide variety of media sources, including those requiring Digital Rights Management (DRM), and provides a high-level API for media transport control, device control and browsing, and media library management; and it automatically detects media devices and integrates their contents into a general database view. The applications the MME can be used to develop include:

· transport media systems

· in-seat entertainment systems

· medical device imaging and sound monitoring units

· industrial control systems

The MME lets Human-Machine Interface (HMI) developers apply their talents to designing the best possible user experience instead of focusing on managing the media. When you build a client application that uses the MME, you can focus on:

· designing and building the best possible user interface (HMI)

· implementing simple playback functionality such as track session creation, “play”, “next”, “pause” etc.

· configuring audio and video output

The QNX® SDK for Apps and Media leverages open technologies for application development (HTML5, Qt, OpenGL ES) and allows device manufacturers to build compelling mobile-like interfaces with full multimedia capabilities, powered by secure, reliable, and field-proven QNX technologies.

Driven by the smartphone generation, embedded device manufacturers are being forced to build more compelling UIs. Building smartphone-like UIs requires many subsystems including multimedia, audio, video codecs and graphics subsystem that make it easy to control, render from multiple sources.

BlackBerry QNX provides a platform that brings the user experience of mobile devices to secure and reliable embedded systems.

Using HTML5 or Qt to design the system’s user interface can dramatically reduce development efforts, especially when compared to designing with traditional embedded UI toolkits.

With the QNX SDK for Apps and Media, developers have a common tool set to build, style, and animate applications for embedded devices. Pre-integrated software with support for HTML5 and Qt 5.3 will move you to the prototyping phase of your next project, fast.

Used by over 500,000 developers worldwide, Qt is a full framework that enables the development of powerful, interactive and platform-independent applications. Qt applications run native on desktop, embedded and mobile host systems, enabling them to deliver performance that is far superior to other cross-platform application development frameworks. Qt’s support for multiple platforms and operating systems allows developers to save significant time related to porting to other devices.

Qt is created by developers for developers where making developers’ lives easier is a top priority. It provides an incomparable developer experience with the tools necessary to create amazing user experiences. Qt is platform agnostic and believes in making sure that all developers are able to target multiple platforms with one framework by simply reusing code. Qt gives freedom to the developer. Code less. Create more. Deploy everywhere.

Topic D – Device Management

Provide a summary of the devices (disks, printers, etc.) and memory managed by this operating system and how it is similar to and deferent from a standard PC. Suggested sub-topics include:

·   What types of disk drives and file systems does it support

·   What type of input devices does it support

·   What type of output devices does it support

# CD-ROMs and DVDs

You usually attach CD and DVD drives to a SCSI or EIDE(ATA) bus; which driver you use depends on the bus. Ensure that the hardware is set up correctly and that the BIOS detects the hardware properly. If you attached the drive to an EIDE bus, simply use the [devb-eide](http://www.qnx.com/developers/docs/6.5.0/topic/com.qnx.doc.neutrino_utilities/d/devb-eide.html) driver. If the drive is on a SCSI bus, you need to determine the proper driver for your SCSI interface

# Floppy disks

The driver for a floppy drive is [devb-fdc](http://www.qnx.com/developers/docs/6.5.0/topic/com.qnx.doc.neutrino_utilities/d/devb-fdc.html). In order to use a floppy disk, you need to ensure that the floppy controller is enabled in the BIOS, and that the BIOS is configured to recognize the correct type of floppy drive (e.g. 1.44MB/2.88MB). The driver uses these locations as default:

· I/O port 0x3f0

· IRQ 6

· DMA 2

# Hard disks

A self-hosted system, by default, detects the disk controller that's installed on the system, and then starts the appropriate driver for it.

On a self-hosted system, the [diskboot](http://www.qnx.com/developers/docs/6.5.0/topic/com.qnx.doc.neutrino_utilities/d/diskboot.html) utility in the OS image starts the block I/O drivers. If you want to change the way that the driver is started, you'll need to change the startup image and the options to diskboot

The devi-\* set of drivers handles input under Photon. The type of input device attached to your system determines which driver you need to use. Photon input can consist of a single mouse, a mouse and a keyboard, or many mice at the same time (provided you have the space).

The [inputtrap](http://www.qnx.com/developers/docs/6.5.0/topic/com.qnx.doc.neutrino_utilities/i/inputtrap.html) utility automatically detects basic input devices (non-USB keyboards and mice). The Photon startup script invokes this utility after starting the graphics adapters.

Mice and keyboards both use the [devi-hirun](http://www.qnx.com/developers/docs/6.5.0/topic/com.qnx.doc.neutrino_utilities/d/devi-hirun.html) driver. The type of mouse attached to your system determines which options you need to use. For a serial mouse, you need to specify the correct protocol (e.g. the Microsoft Mouse protocol).

Keyboards are detected on these interfaces:

· AT-style adapters appear as /dev/kbddev.

· PS/2 keyboards appear as /dev/kbd.

Topic E – Security

Provide a summary of the security features provided by this operating system and how it is similar to and deferent from a standard PC. Suggested sub-topics include:

·   What types of user accounts and user permissions does it support

·   How does it protect against conflicts / interference between legitimate application processes

·   How does it protect against malicious software

·   How does it support software updates and security updates

The monetary value of data, the ability to cause serious harm, and the interoperability and connectivity of mission-critical systems make them vulnerable targets. Hijacking of medical devices and exploiting software vulnerabilities in not only medical devices but hospital systems is on the rise. With the emergence of 5G and increased connectivity, Industrial automation systems and robots that perform valuable and precise actions have seen an increase in attacks that impact the ability to perform with a high degree of safety, accuracy, and integrity.

BlackBerry QNX is a leader in supplying safe, secure, and reliable software platforms for mission critical systems with an established pedigree in cyber security.

BlackBerry QNX offers the most advanced and secure embedded operating system (OS) for mission-critical systems.

* Secure Software Update
* Secure Supply Chain
* Managed PKI Authentication
* FIPS Certified Encryption
* OS Certified to ISO/IEC 15408
* Cybersecurity Services

# Setting up a firewall

Just as a building or vehicle uses specially constructed walls to prevent the spread of fire, so computer systems use *firewalls* to prevent or limit access to certain applications or systems and to protect systems from malicious attacks.

To create a firewall under Neutrino, you can use a combination of:

· IP Filtering to control access to your machine

· Network Address Translation (NAT) — known to Linux users as IP masquerading — to connect several computers through a common external interface

For more information, see ftp://ftp3.usa.openbsd.org/pub/OpenBSD/doc/pf-faq.pdf in the OpenBSD documentation.

## IPSec

IPsec is a security protocol for the Internet Protocol layer that you can use, for example, to set up a secure tunnel between machines or networks. It consists of these subprotocols:

AH (Authentication Header)

Guarantees the integrity of the IP packet and protects it from intermediate alteration or impersonation, by attaching a cryptographic checksum computed by one-way hash functions.

ESP (Encapsulated Security Payload)

Protects the IP payload from wire-tapping, by encrypting it using secret-key cryptography algorithms.

IPsec has these modes of operation:

Transport

Protects peer-to-peer communication between end nodes.

Tunnel

Supports IP-in-IP encapsulation operation and is designed for security gateways, such as VPN configurations.

Topic F – Network Connectivity

Provide a summary of the network connectivity provided by this operating system and how it is similar to and deferent from a standard PC. Suggested sub-topics include:

·   Is the computer stand-alone or part of a larger network

·   What type of network and internet connections does it provide

·   Does it provide other services such as backup, firewall, etc.

Device Connectivity Due to the inherent connectivity of the QNX SDK for Apps & Media, a single platform supports media sharing among multiple users, immediate and unique identification of media devices and streams (including mobile phones and media players), auto synchronization to databases, and multiple playback and record paths.

Verifying a network connection

While connected, from Windows type ipconfig, and you should notice the following output:

PPP adapter QNX:

         Connection-specific DNS Suffix  . :

         IP Address. . . . . . . . . . . . : 10.0.0.2

         Subnet Mask . . . . . . . . . . . : 255.255.255.255

         Default Gateway . . . . . . . . . : 10.0.0.2

In addition, you should also be able to successfully ping 10.0.0.1.

If you started qconn on your target, you can now use QNX Momentics IDE to debug a program for a qconn/IP debug session.

Before you configure this type of connection, you'll need to consider the following:

Use of the internet and/or corporate VPN connections will be disrupted while the PPP connection is made unless you deselect the option Use default gateway on remote network on the Advanced TCP/IP Settings dialog.

If you experience communications problems, it may be helpful to run the following command, and or slay and restart the devc-ser\* driver. stty raw sane </dev/ser1

If you experience communication problems on a 3-wire cable (no control signals), ensure that you disable hardware flow control. (In all cases, software flow control should be disabled since 8-bit binary data is being sent.) Use the following command to disable hardware flow control: stty 115200 par=none bits=8 stopb=1 -isflow -osflow -ihflow -ohflow </dev/ser1

Backup strategies

Your backup strategy will consist of making one or more backups on a periodic or triggered basis. For each backup you incorporate in your strategy, you have to choose:

-   the storage media and location of the backup data

-   how to archive, and optionally, compress your data

-   the contents, and frequency or trigger condition of the backup

-   automated versus manual backup

-   local versus remote control of the backup

Often, a comprehensive backup strategy incorporates some backups on the local side (i.e. controlled and stored on the same machine that the data is located on), and others that copy data to a remote machine. For example, you might automatically back up a developer's data to a second hard drive partition on a daily basis and have a central server automatically back up the developer's data to a central location on a weekly basis.

Choosing backup storage media and location

Early in the process of determining your backup strategy, you're likely to choose the location of your data backups and the media to store the backups on, because these choices are the primary factors that affect the hardware and media costs associated with the system. To make the best choice, first take a close look at what you need to back up, and how often you need to do it. This information determines the storage capacity, transfer bandwidth, and the degree to which multiple users can share the resource.

Your choices of backup media vary, depending on whether you create backup copies of your data on a local machine or on a remote machine by transferring the data via a network:

Local backups offer the advantage of speed and potentially greater control by the end user, but are limited to backup technologies and media types that Neutrino supports directly.

Remote backups often allow use of company-wide backup facilities and open up additional storage options, but are limited by the need to transfer data across a network and by the fact that the facilities are often shared, restricting your access for storing or retrieving your backups.

Here's a summary of some of the backup media you might consider, and their availability for local or remote backups:

|  |  |  |
| --- | --- | --- |
| **Media** | **Local/Neutrino** | **Remote** |
| Floppy | Yes | Yes |
| LS-120 | Yes | Yes |
| Tape | No | Yes |
| CD | Yes | Yes |
| DVD | No | Yes |
| Hard disk | Yes | Yes |
| Flash device | Yes | Yes |
| USB mass-storage device | Yes |  |

Choosing a backup format

When backing up your data, you need to decide whether to back up each file and directory separately, or in an archive with a collection of other files. You also need to decide whether or not to compress your data to reduce the storage requirements for your backups.

The time lost to compression and decompression may be offset to a degree by the reduced time it takes to write or read the compressed data to media or to transfer it through a network. To reduce the expense of compression, you may choose to compress the backup copies of your data as a background task after the data has been copied — possibly days or weeks after — to reduce the storage requirements of older backups while keeping newer backups as accessible as possible.

Controlling your backup

You should back up often enough so that you can recover data that's still current or can be made current with minimal work. In a software development group, this may range from a day to a week. Each day of out-of-date backup will generally cost you a day of redevelopment. If you're saving financial or point-of-sale data, then daily or even twice-daily backups are common. It's a good idea to maintain off-site storage.

**Step 2 – Concept Map**

Create a  “concept map” as a final report of your organized research.

·   Use the diagram in the introduction as a starting point.

·   You should have six (6) first level topics from “Application Software”

to “Network Connectivity”

·   Each first level topic should have at least three (3) sub-topics

·   Each sub-topic should be supported by a number of facts / items of interest

Select the best and most interesting information from your organized research.

·   Summarize and edit your information to fit on the concept map.

Upload your Research Notes and Concept Map to your GitHub Repository

·       Your concept map can be created using: Smart Ideas, Prezi, PowerPoint or other

similar applications.

·       Option1: Create and upload a PDF of your concept map

·       Option2: Include a link to your Concept Map in your Student Questions

o   Make sure that your link is Sharable so Mr. Nestor can open your map

**Appendix A**

|  |  |  |
| --- | --- | --- |
| **Operating System** | **Student 1** | **Student 2** |
| Ubuntu  (Linux) |  |  |
| z/OS  (IBM) |  |  |
| Solaris  (Oracle) |  |  |
| HP-UX  (Hewlett Packard) |  |  |
| Windows NT  (Windows Server) |  |  |
| Red Hat Enterprise  (IBM Summit) |  |  |
| QNX  (Blackberry) |  |  |
| VxWorks  (Wind River) |  |  |
| AOSP  (Android Alphabet) |  |  |
| Ubuntu  (Linux) |  |  |
| z/OS  (IBM) |  |  |
| Solaris  (Oracle) |  |  |
| HP-UX  (Hewlett Packard) |  |  |
| Windows NT  (Windows Server) |  |  |
| Red Hat Enterprise  (IBM Summit) |  |  |
| QNX  (Blackberry) |  |  |
| VxWorks  (Wind River) |  |  |
| AOSP  (Android Alphabet) |  |  |
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