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**Project proposal**

**Computer Networks**

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**Linux Kernel Versions and Their Architectural Evolution**

**1991: Version 0.01**

* **Initial Architecture**:
  + Specifically designed for the Intel 80386 processor.
  + Supported only basic task-switching and a minimal set of hardware features.
  + Did not include networking or support for advanced hardware.
* **Key Milestones**:
  + Publicly announced by Linus Torvalds on August 25, 1991.
  + First release on September 17, 1991.
  + Marked the beginning of Linux's journey as a free and open-source operating system.

**1992: GNU GPL Relicensing**

* **Architectural Changes**:
  + Maintained focus on x86 architecture (Intel 80386).
  + Integrated GNU tools and libraries, expanding application support.
* **Key Evolution**:
  + Relicensing under the GNU General Public License (GPL) enabled broader collaboration and development.
  + Laid the foundation for Linux distributions by incorporating the GNU ecosystem.

**1993: Pre-Version 1.0**

* **Architecture Development**:
  + Kernel adaptations allowed it to work seamlessly with the GNU environment.
  + Support for a variety of applications began to emerge.
* **Notable Events**:
  + Over 100 developers contributed to kernel development.
  + Slackware Linux, the oldest active distribution, was released.
  + The Debian project, which later became the largest community-based distribution, was launched.

**1994: Version 1.0**

* **Architectural Maturity**:
  + First stable version of Linux, designed for x86 systems.
  + Included basic networking capabilities and better integration with GNU tools.
* **Key Features**:
  + Support for TCP/IP networking, enabling basic internet connectivity.
  + Integration with the XFree86 project for graphical user interface (GUI) support.
* **Significance**:
  + Marked Linux's transition from a hobby project to a viable operating system.

**1995: Porting to DEC Alpha and Sun SPARC**

* **Expanded Architecture**:
  + Linux was ported to non-x86 architectures like DEC Alpha and Sun SPARC.
  + Set the stage for Linux to become a platform-independent OS.
* **Key Evolution**:
  + Demonstrated Linux's flexibility and adaptability for various hardware platforms.

**1996: Version 2.0**

* **Architectural Breakthrough**:
  + Introduced support for symmetric multiprocessing (SMP), enabling multi-core processors.
  + Allowed Linux to scale for enterprise-level applications.
* **Key Features**:
  + Support for multiple processors working simultaneously.
  + Expanded hardware compatibility and improved networking.
* **Significance**:
  + Positioned Linux as a serious alternative to commercial Unix systems.

**1998: ARM Port and Enterprise Adoption**

* **ARM Architecture**:
  + ARM support was merged into the kernel, making Linux a strong choice for embedded systems.
* **Enterprise Expansion**:
  + Major companies like IBM and Oracle announced support for Linux.
* **Milestones**:
  + KDE (K Desktop Environment) development began, offering a graphical desktop interface.
  + Linux appeared on the TOP500 list of supercomputers for the first time.

**1999: Version 2.2**

* **Architectural Enhancements**:
  + Improved SMP capabilities for better scalability.
  + Enhanced networking stack for high-performance applications.
* **Key Developments**:
  + GNOME project began, aimed at creating a free desktop environment.
  + Increased enterprise adoption with IBM announcing extensive Linux support.

**2001: Version 2.4**

* **Architectural Features**:
  + Added support for USB devices and ISA Plug-and-Play.
  + Introduced large file system support, accommodating files larger than 2 GB.
* **Significance**:
  + Enhanced Linux's usability for desktops and servers.

**2003: Version 2.6**

* **Major Architecture Update**:
  + Introduced 64-bit architecture support for AMD64 and IA-64 processors.
  + Improved scalability and support for enterprise-class workloads.
* **Key Features**:
  + Integrated security enhancements like SELinux (Security-Enhanced Linux).
  + Provided better kernel threading for improved performance.

**2011: Version 3.0**

* **Streamlined Architecture**:
  + Focused on modernizing the kernel without major redesigns.
  + Enhanced multi-core processor support and improved device drivers.
* **Significance**:
  + Marked a milestone in Linux's evolution, though primarily a version number change.

**2015: Version 4.0**

* **Architectural Innovations**:
  + Introduced live kernel patching, enabling updates without rebooting.
  + Optimized for cloud systems and modern hardware.
* **Key Features**:
  + Improved support for ARM and embedded devices.
  + Enhanced scalability for cloud computing.

**2019: Version 5.0**

* **Advanced Architecture**:
  + Focused on next-generation hardware like GPUs and ARM64.
  + Enhanced support for AI workloads and high-performance storage devices.
* **Significance**:
  + Addressed the growing needs of modern computing, including AI and IoT.

**2022: Version 6.0**

* **Cutting-Edge Architecture**:
  + Introduced support for the RISC-V architecture, an open-source hardware platform.
  + Optimized multi-threaded processing for modern CPUs.
* **Key Features**:
  + Expanded support for newer hardware technologies and security improvements.
* **Significance**:
  + Highlighted Linux's adaptability to emerging trends like AI, machine learning, and cloud-native systems.

**Key Trends in Architectural Evolution**

1. **Scalability**:
   * From single-core to multi-core and SMP systems.
2. **Portability**:
   * Expanded from x86 to platforms like ARM, PowerPC, and RISC-V.
3. **Security**:
   * Introduction of frameworks like SELinux.
4. **Performance**:
   * Continuous optimization for high-performance computing and supercomputers.