Linux Storage Server & NFS Advancements:

Creating a High-Performance Standard for AI Workloads

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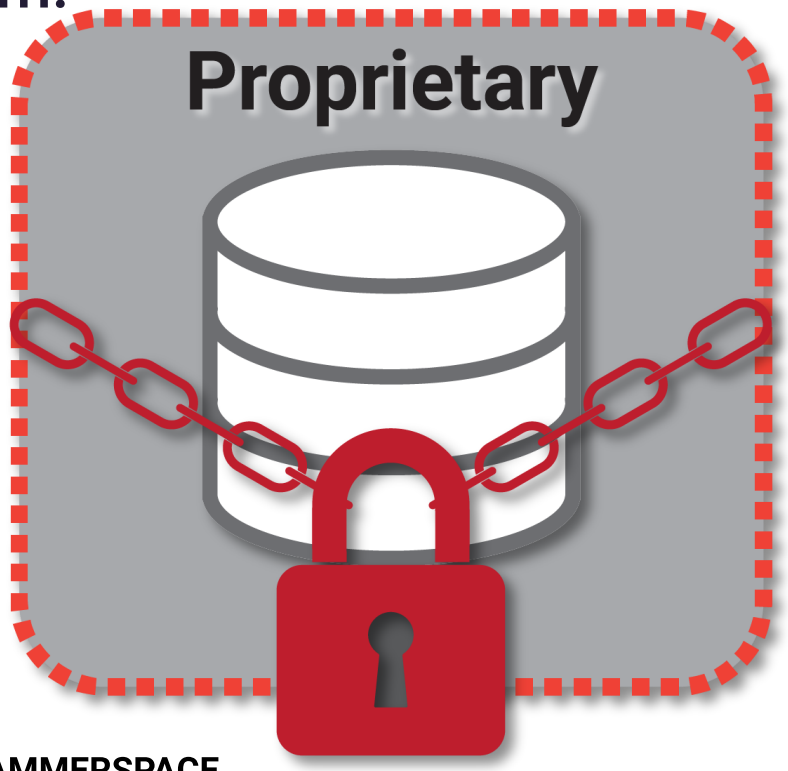
Linux Dominates in HPC and Web

AI is Driving Enterprise Adoption of HPC and Web Infrastructure Architectures

From:



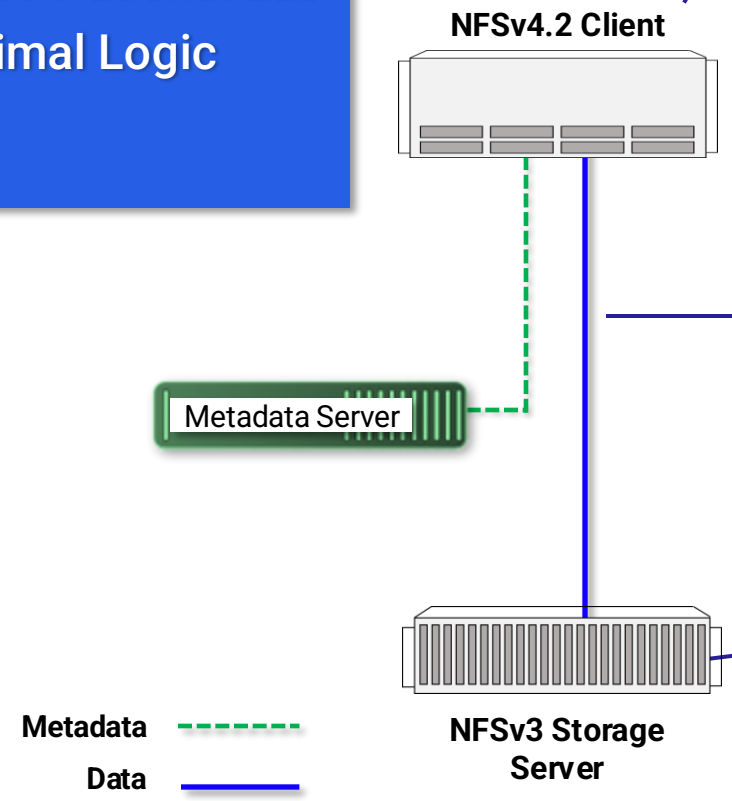
To:

Standards-Based Parallel File System Architecture

-- Parallel NFS v4.2 with Flex files --

Powering High-Performance:

- AI → Meta's Llama 2, 3, & 4
- HPC → Los Alamos National Lab
- VFX → Netflix/Animal Logic
- Web → PayPal



Hardening pNFS for HPC/AI Workloads

- 2018: Enhanced Parallel NFS spec with pNFSv4.2 with Flex Files
  - Eliminated NFS GETATTR chattiness
  - Added telemetry feedback
  - Added N-Connect
- Part of every modern Linux distribution

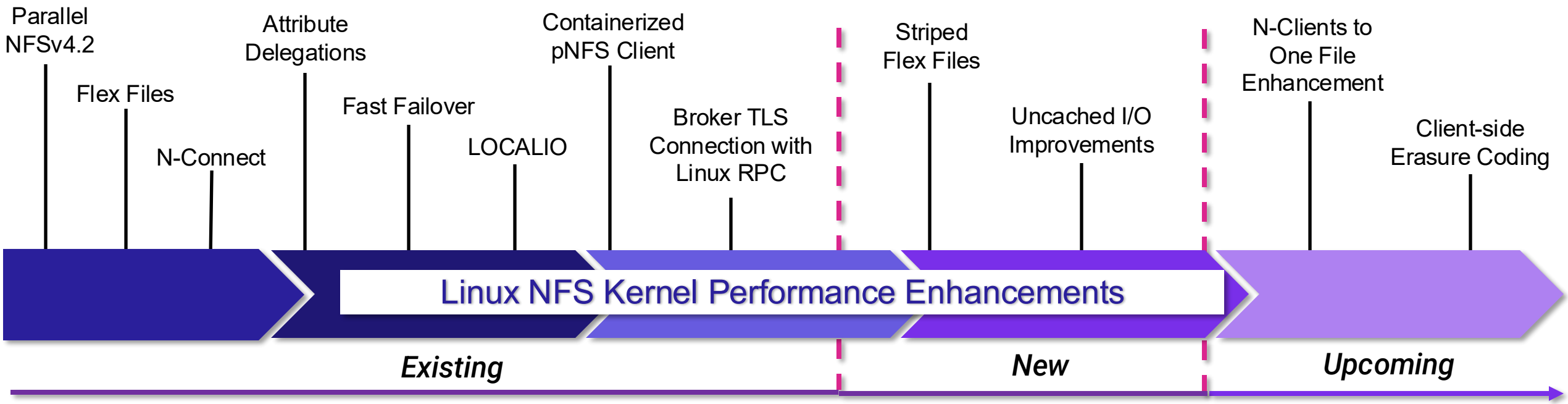
Separate Metadata and Data Paths

- Direct data path using TCP or RDMA
- Provides for multiple parallel connections
- Metadata layer acts as global control plane

Use Any NFSv3 Storage System

- Add any NFS storage volume, from any vendor
- Including GPU server local NVMe

Building Performance into Standard Linux

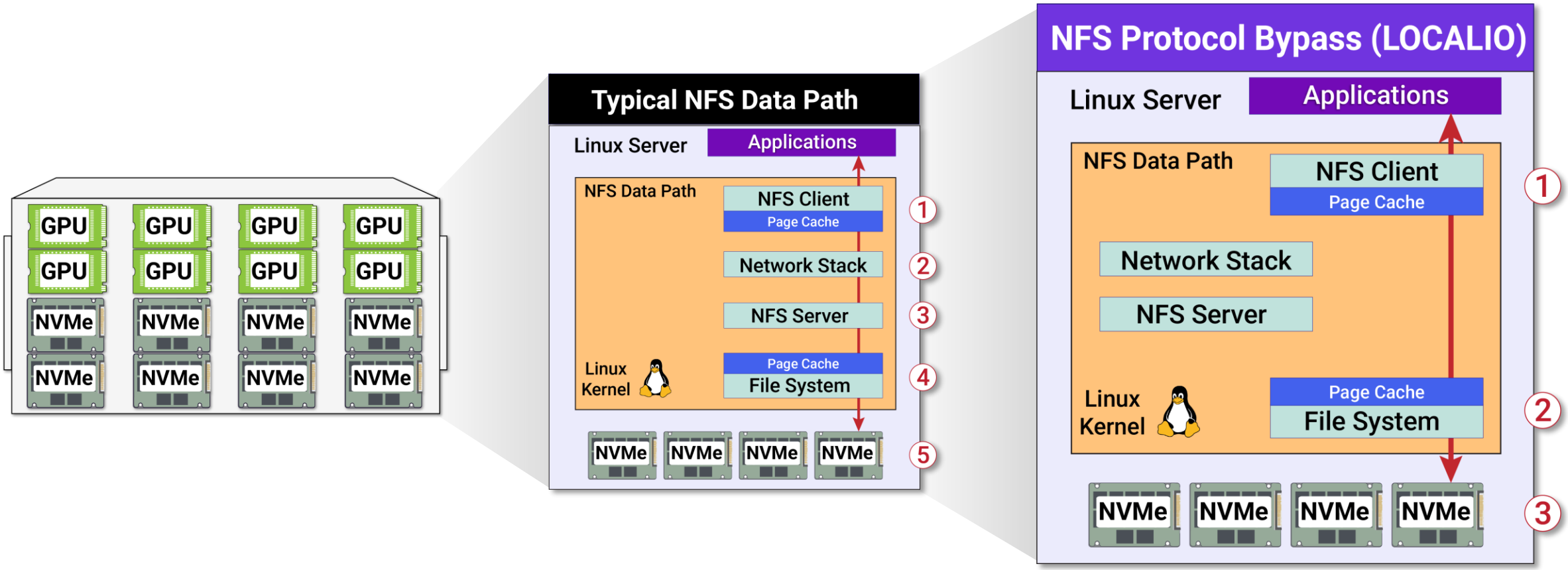


This Means Customers Never Have to Install Proprietary Client Software

Or Alter Existing Storage Servers from Any Vendor

Added Benefits Waiting in the Linux Kernel

Further Reduce Latencies and Maximize GPU Utilization Using LOCALIO (NFS Protocol Bypass)

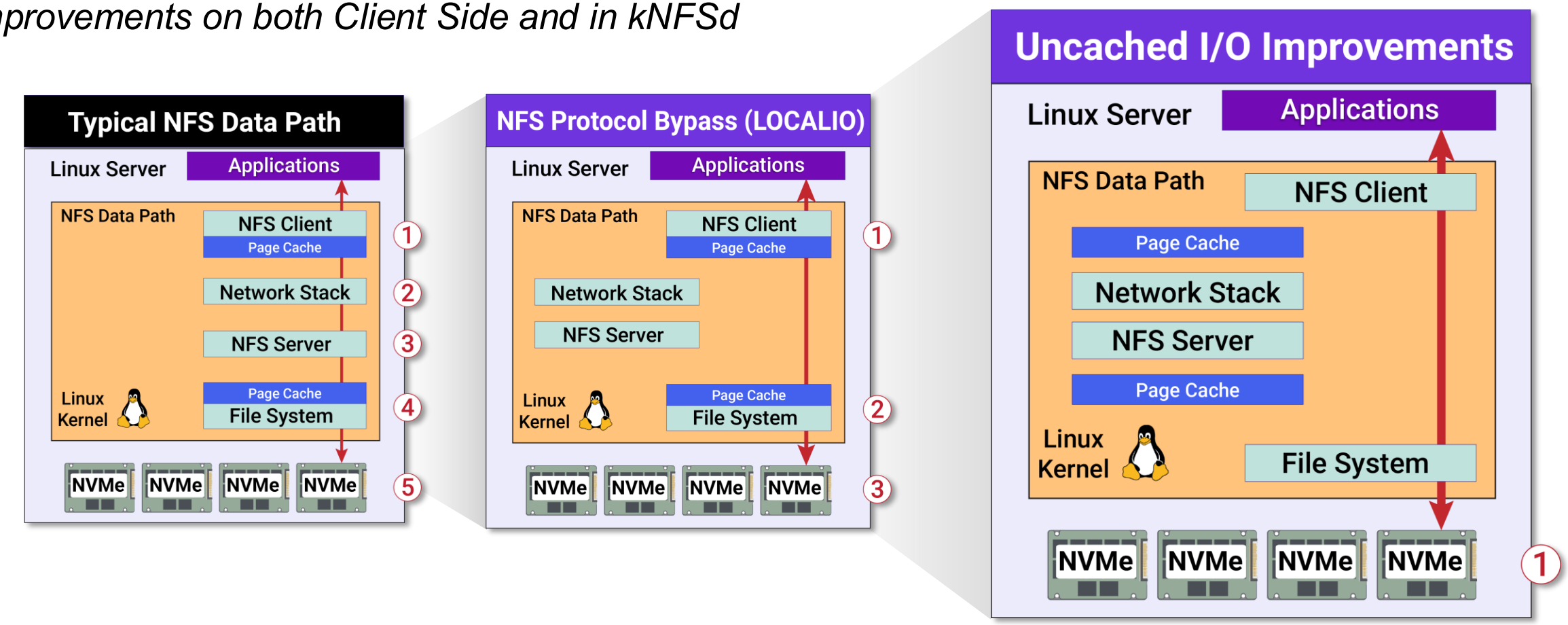


LOCALIO Was Released in Linux Long-Term Support kernel 6.12
Was included in RHEL10 in May 2025

Uncached I/O Improvements

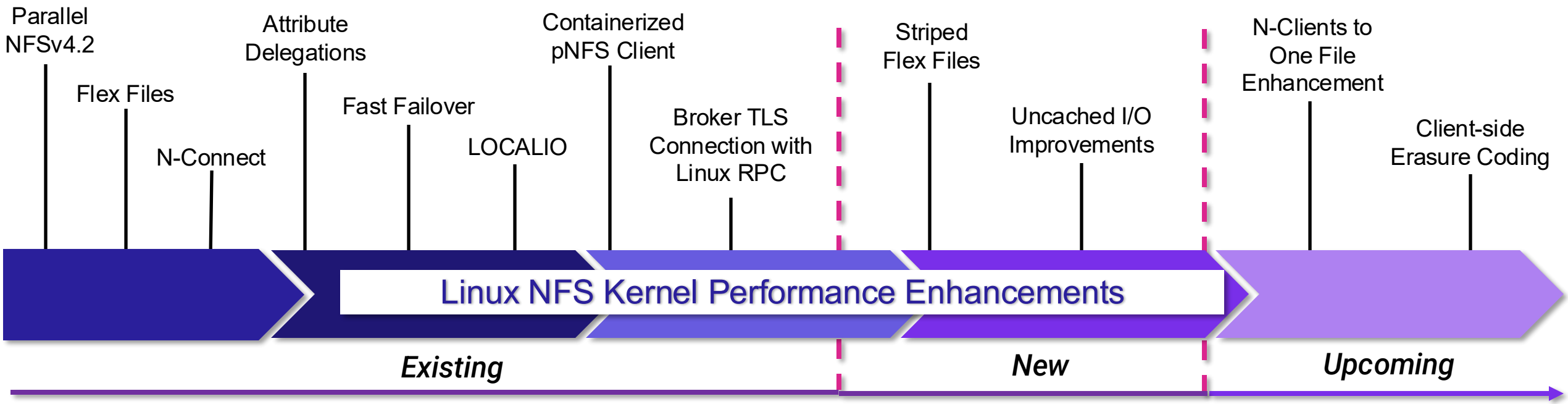
Accelerate I/O with Direct Access, bypassing the Page Cache

Improvements on both Client Side and in kNFSd



Anticipated in near-term future Kernel release

Building Performance into Standard Linux



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Thank You!

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