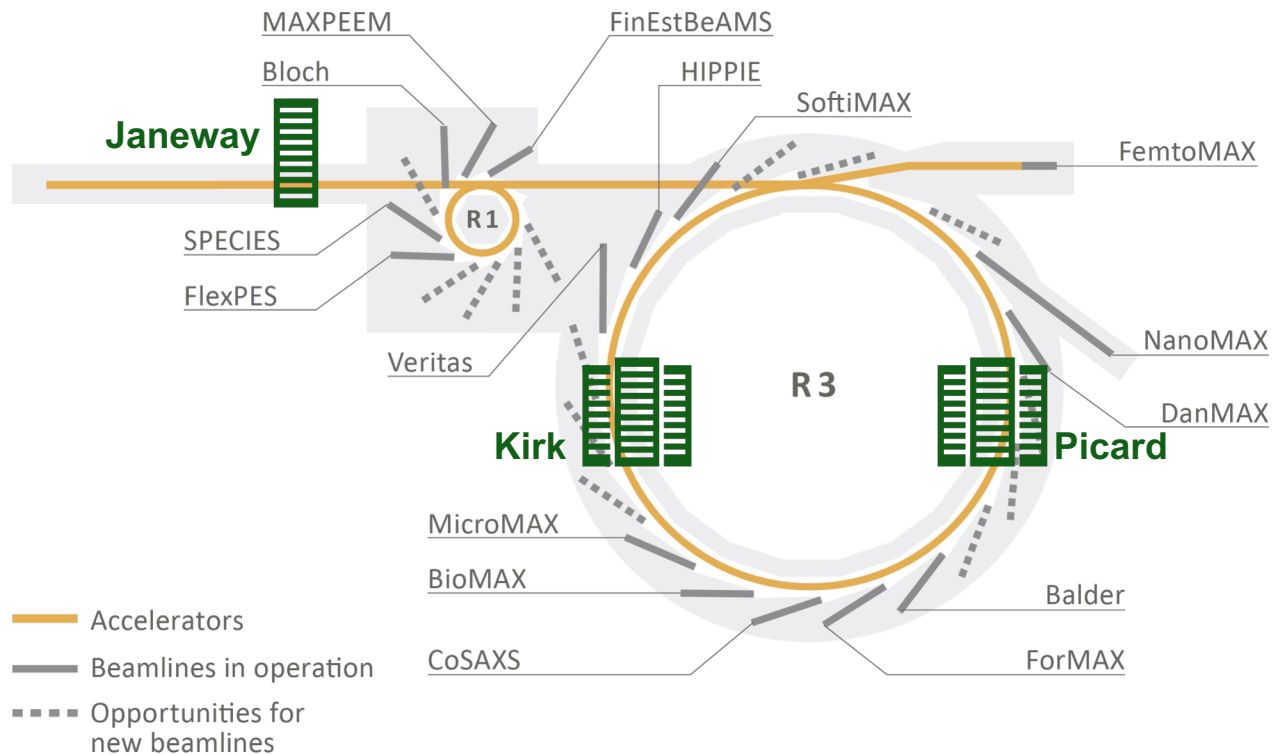


MAX IV Scalable IT Infrastructure for Fault-Tolerant Data Management

High Availability for Continuous Operation

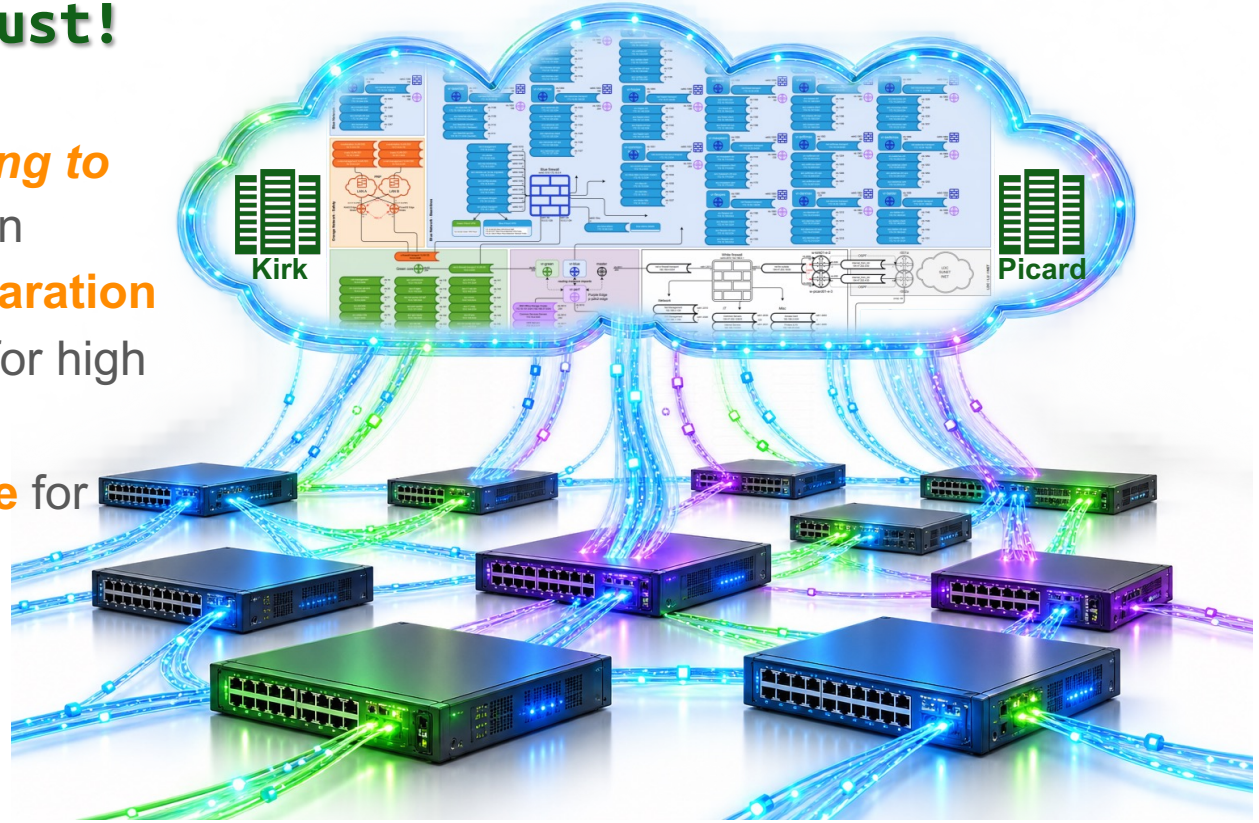


- **2+1** server halls
- **“we can lose one server hall”** design principle



In Network We Trust!

- **“Connect everything to server halls”** design
- Network **traffic separation**
- **Distributed cores** for high availability
- **100Gbps backbone** for data management



Network diagram courtesy of Gaétan Péaquin

Wrapping image generated with AI · ChatGPT

Resilient Core Services

- **VMWare Clusters**

- Machine VMs
- Beamlines VMs
- Infrastructure Services

- **XCP-ng**

- Redundant Services
 - DHCP
 - DNS
 - AD
- Quorum VMs
- Kubernetes' Control Plane VMs

- **Dell PowerStore**

- Metro Volumes

- **NetApp** SMB/NFS Filers

The image displays three screenshots of IT infrastructure management interfaces:

- vSphere Client:** A screenshot of the vSphere Client interface showing a search bar and a list of environments. The 'MAX IV' environment is selected, showing a hierarchy of folders including 'Blue', 'Automation', 'Beamlines', 'Balder', and 'BioMAX'. The 'BioMAX' folder is expanded, showing a list of VMs including 'b-v-biomax-adb-0', 'b-v-biomax-cc-0', 'b-v-biomax-cc-1', 'b-v-biomax-cc-2', 'b-v-biomax-csdb-0', 'b-v-biomax-csproxy-0', and 'b-v-biomax-ec-0'.
- Xen Orchestra Appliance:** A screenshot of the Xen Orchestra Appliance interface showing the 'POOLS' tab. It displays a table of pools with columns for 'POOL', 'IP ADDRESS', 'STATUS', and 'PRIMARY HOST'. The table lists three pools: 'Janeway Pool', 'Kirk Pool', and 'Picard Pool', all with a status of 'Connected'.
- PowerStore:** A screenshot of the Dell PowerStore interface showing the 'Metro Volume' configuration for 'picard03-p9000t-01'. It displays a diagram of the Metro Volume configuration with two nodes: 'picard03-p9000t-01' and 'w-kirk03-p9000t-01'. The nodes are connected by a double-headed arrow, indicating an 'Operating Normally (Active-Active)' state. The 'picard03-p9000t-01' node is labeled 'Signed-in' and 'I/O', while the 'w-kirk03-p9000t-01' node is labeled 'Preferred' and 'I/O'. The 'Metro Volume Details' section on the right shows the status as 'Operating Normally (Active-Active)', the local preferred role as 'Non-Preferred', the remote system as 'w-kirk03-p9000t-01 (192.168.35.34)', the witness name as 'P9k-Witness', and the witness state as 'Engaged'.

Scientific Data Storage

- **IBM Storage Scale**
(a.k.a. GPFS)
- **3 Tiers** scalable architecture
- **InfiniBand Fabric**
- Native clients
 - DAQ
 - HPC
- NFS/SMB Exports

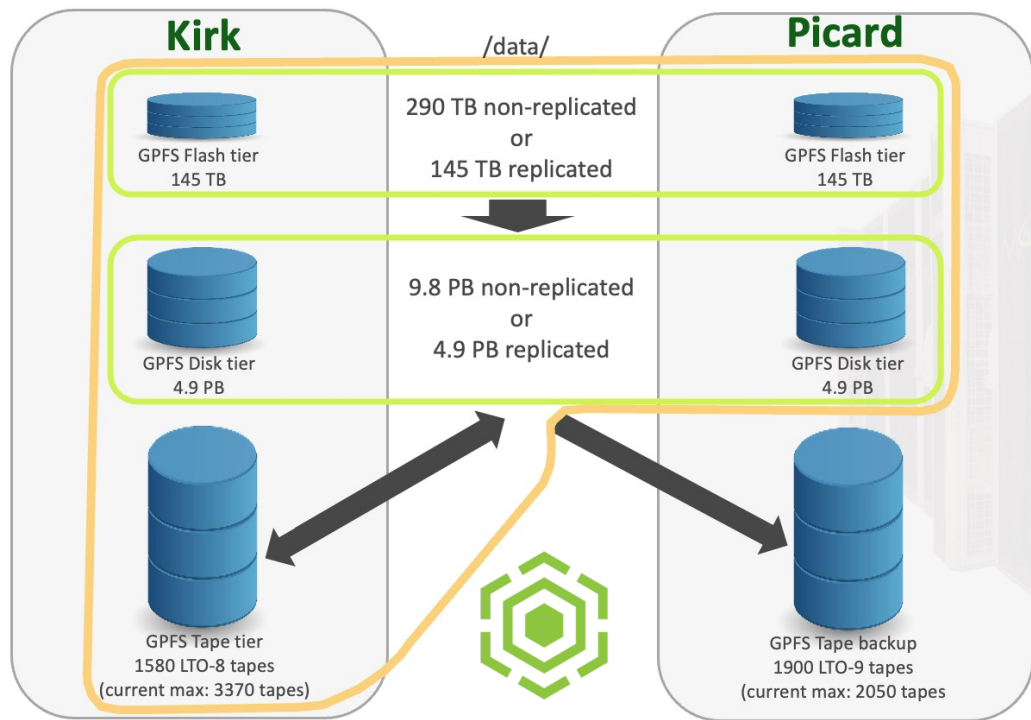
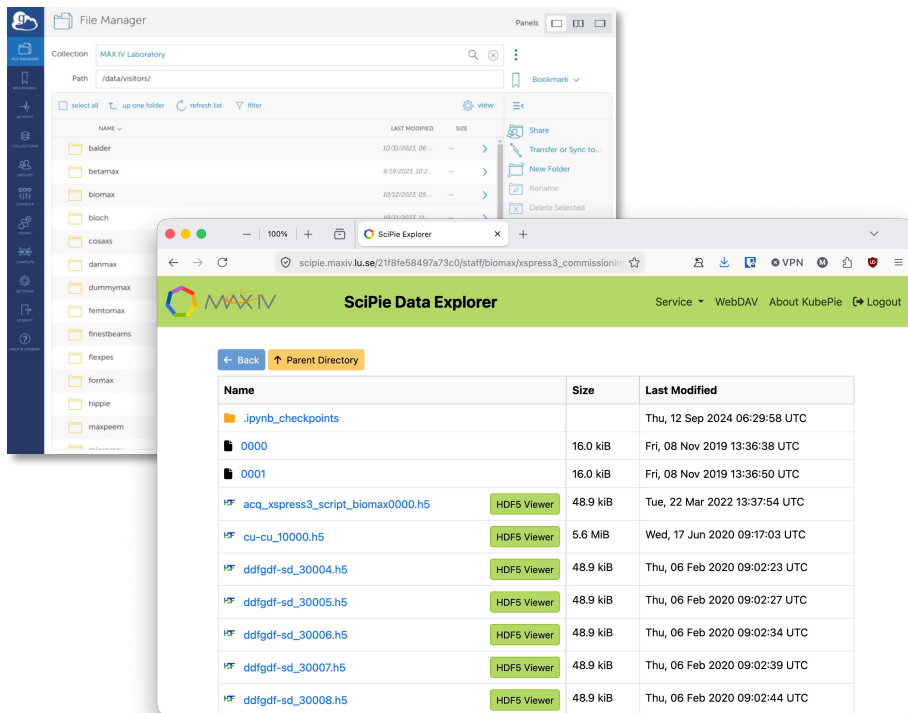


Diagram courtesy of Andreas Mattson

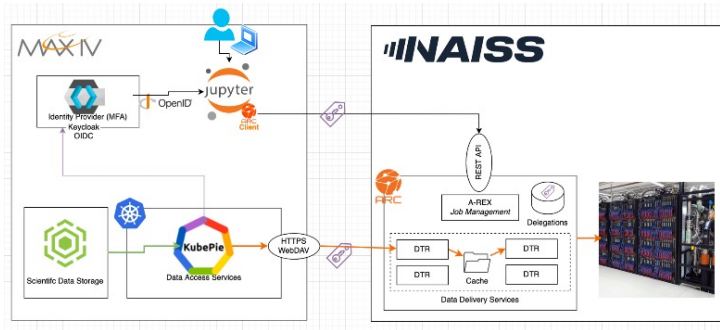
External Data Access

- **SFTP** (2FA)
- **Globus Connect** (via SSO)
- **KubePie** (via SSO)



HPC Resources

- Local **SLURM Clusters**
- **LUNARC** (Centre for Scientific and Technical Computing at Lund University)
- **(pilot project)** National Academic Infrastructure for Supercomputing in Sweden (**NAISS**)



Kubernetes as an Integral Part of IT Infrastructure

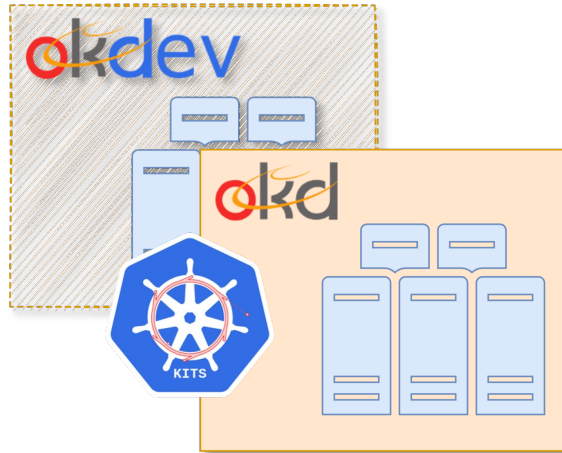
- **Baremetal Clusters**
 - + Control Plane VMs
- **Why Kubernetes?**
 - High-Availability
 - Scalability
 - Automating
 - Deployment
 - Management
 - GitOps



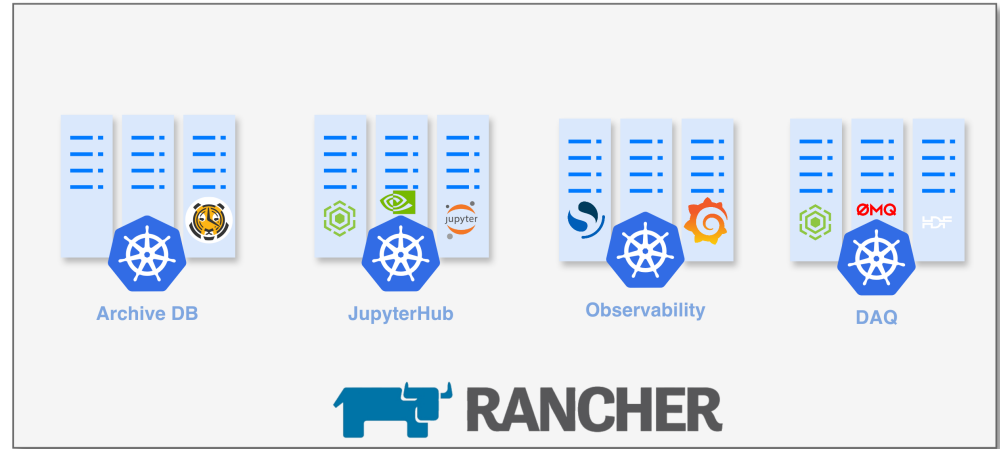
Image generated with AI · ChatGPT

MAX IV Kubernetes Flavors

Lifecycle management of *web-apps* and *infrastructure workloads* with **security hardening**

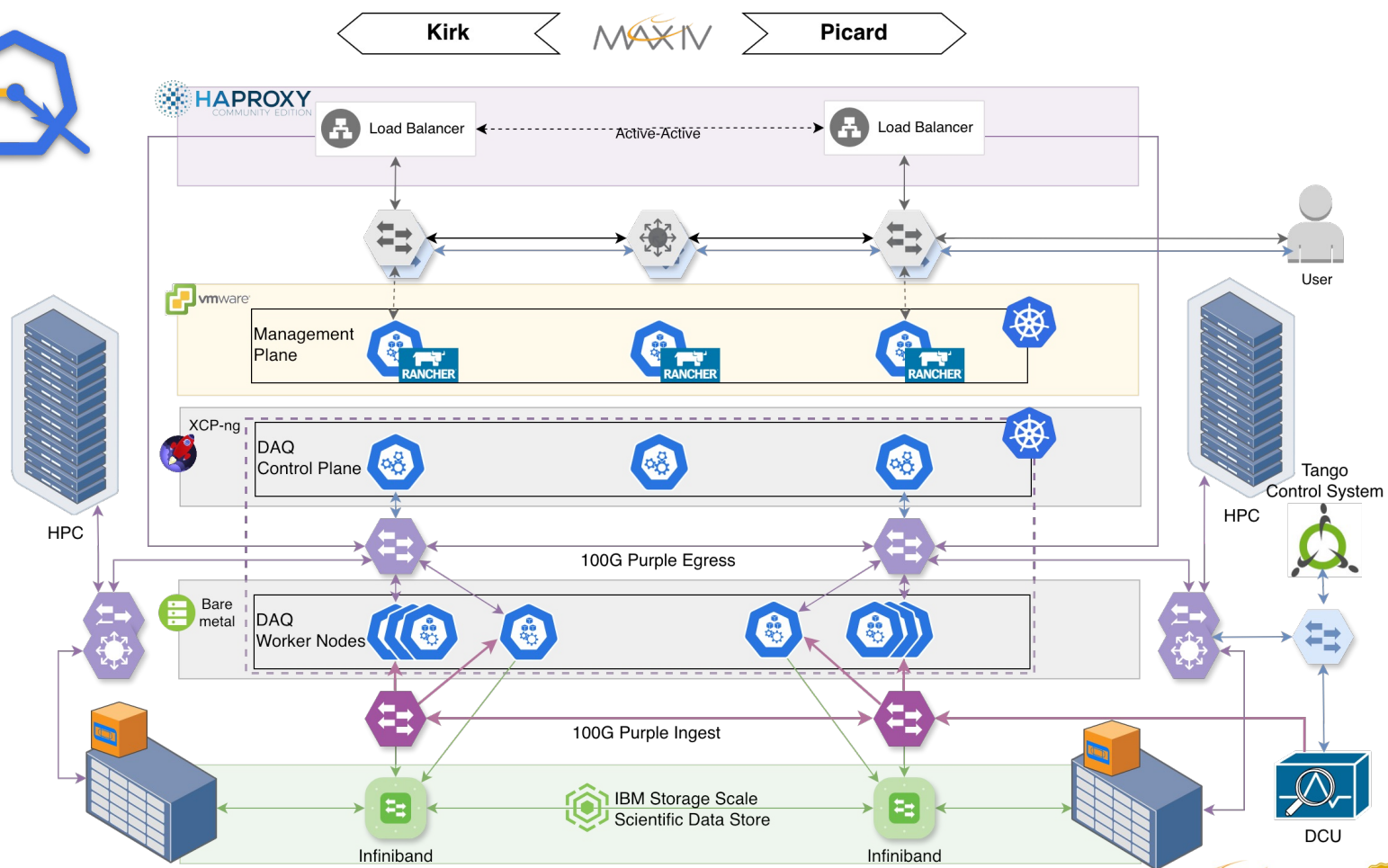


Lightweight, use-case specific setups, when we just need to “*automate deployment, scaling, and management*”





IT Infrastructure for Data Acquisition





*Central image generated with AI - ChatGPT



Thank you for attention!