WALT on Grid'5000 (with NBFS)

or how to pack all my activities into a single project ;)

Etienne Dublé (LIG / CNRS)

Workshop Axes, May 2021

Agenda

Motivation

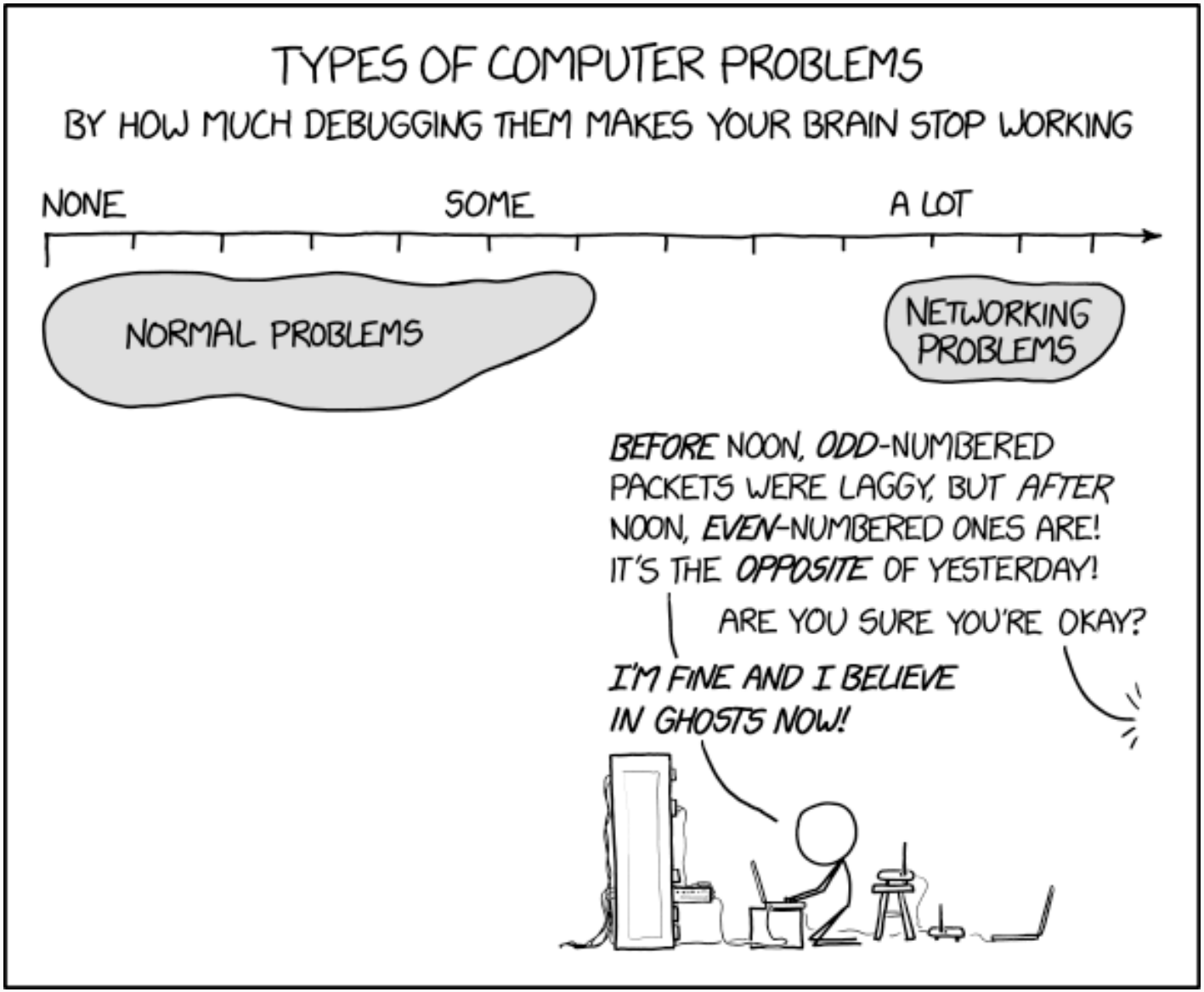
Sample use case

WalT & fast OS prototyping

OS deployment rework

Related news

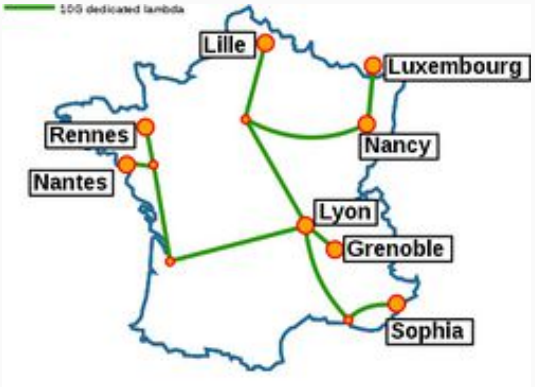
Foreword


TYPES OF COMPUTER PROBLEMS
BY HOW MUCH DEBUGGING THEM MAKES YOUR BRAIN STOP WORKING
NONE
SOME
A LOT
NORMAL PROBLEMS
NETWORKING PROBLEMS
BEFORE NOON, ODD-NUMBERED PACKETS WERE LAGGY, BUT AFTER NOON, EVEN-NUMBERED ONES ARE! IT'S THE OPPOSITE OF YESTERDAY!
ARE YOU SURE YOU'RE OKAY?
I'M FINE AND I BELIEVE IN GHOSTS NOW!

A word about Grid'5000

G5K: What is it?

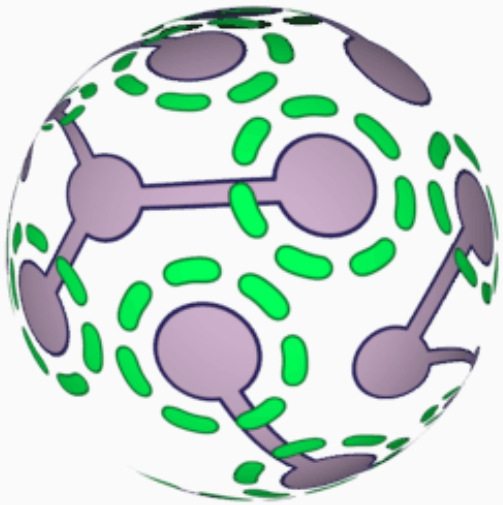
- Infrastructure as a Service
- 8 sites in France
- Accessible to academic community



A word about WALT

WALT: What is it?

- Software to build your own versatile platform
- AFAIK deployed in 4 labs (France, Turkey) and at Schneider Electric
- Open source project



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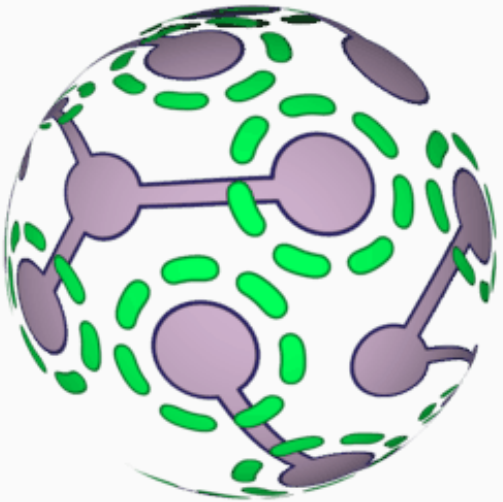

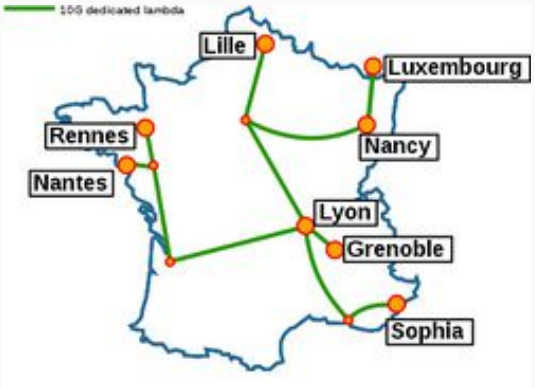

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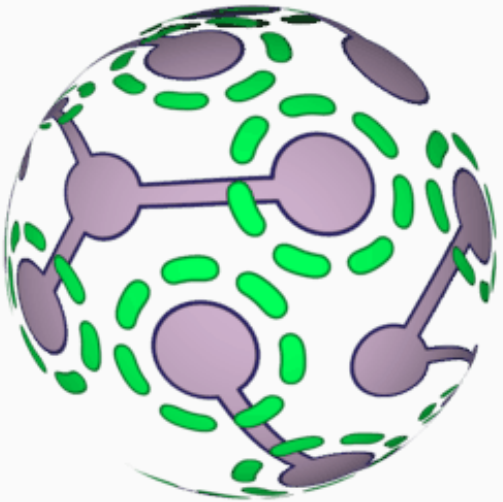

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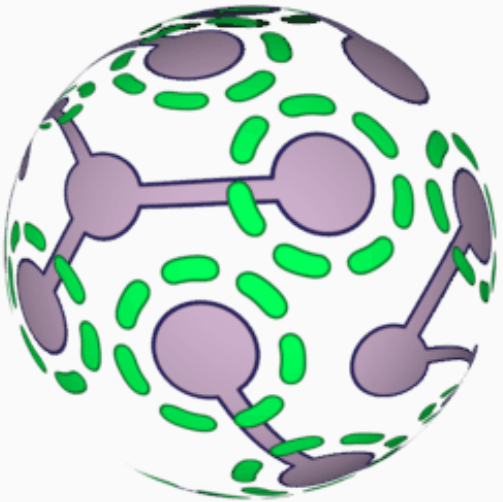

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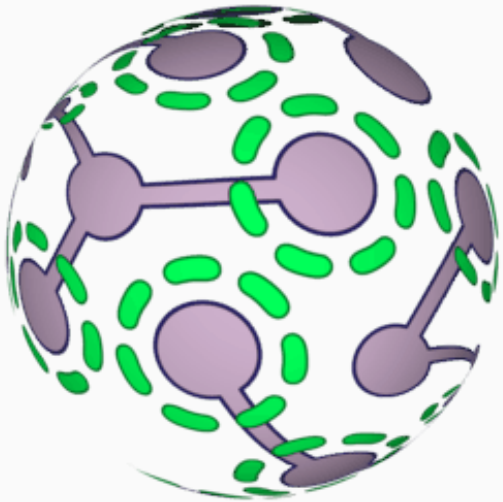

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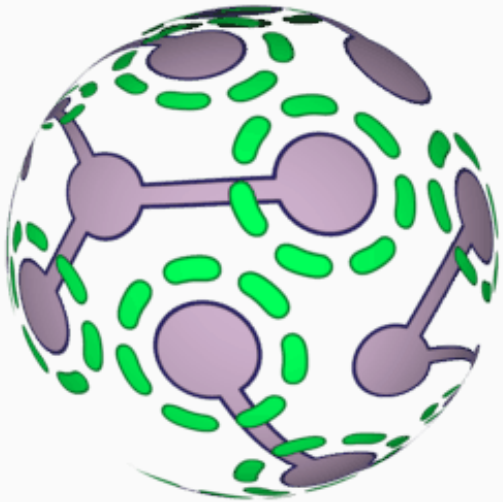
- Limits:
  - Features are limited to what both platforms can do (simplified G5K resources selection, wired network only, no physical access to devices, etc.)



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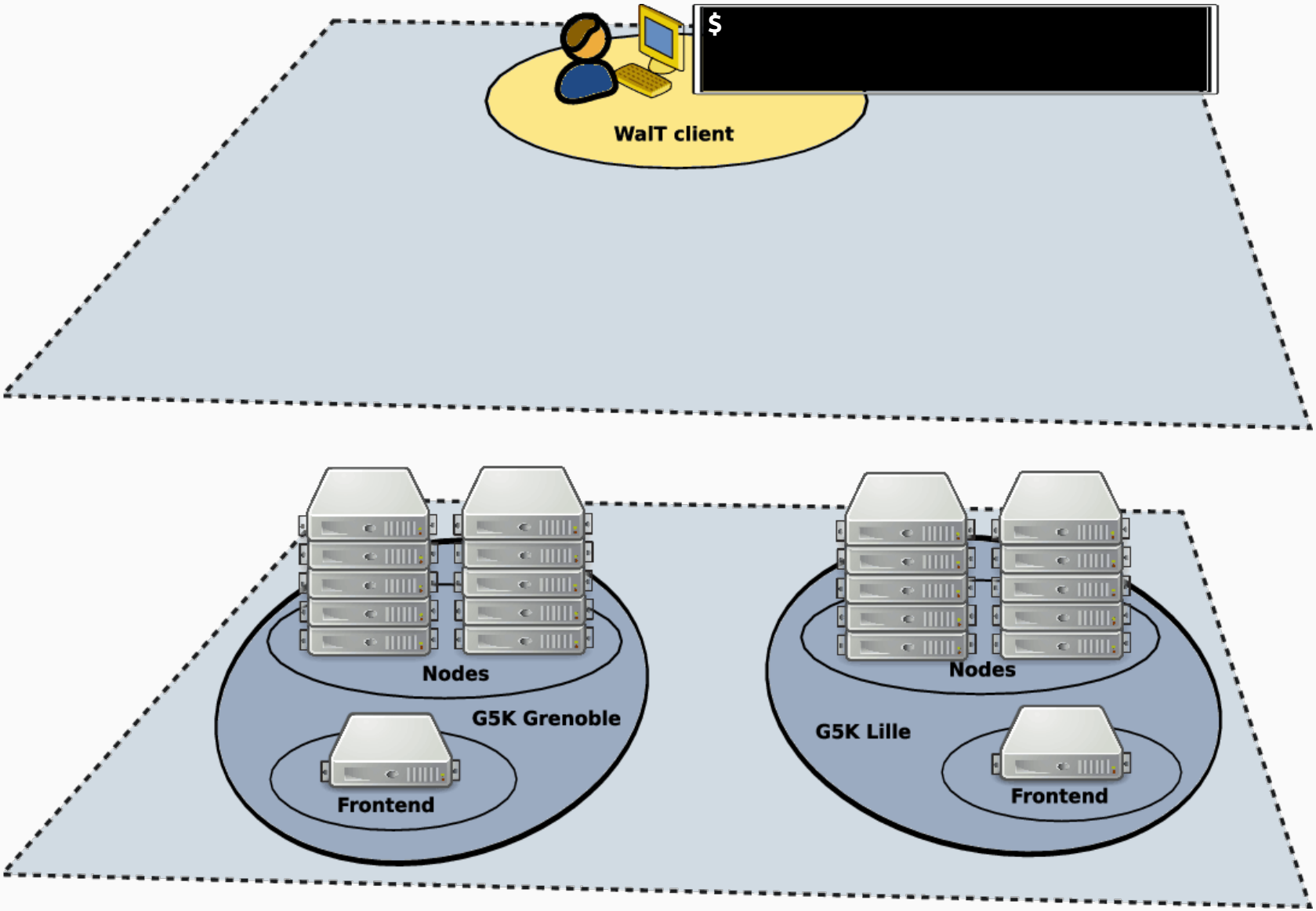

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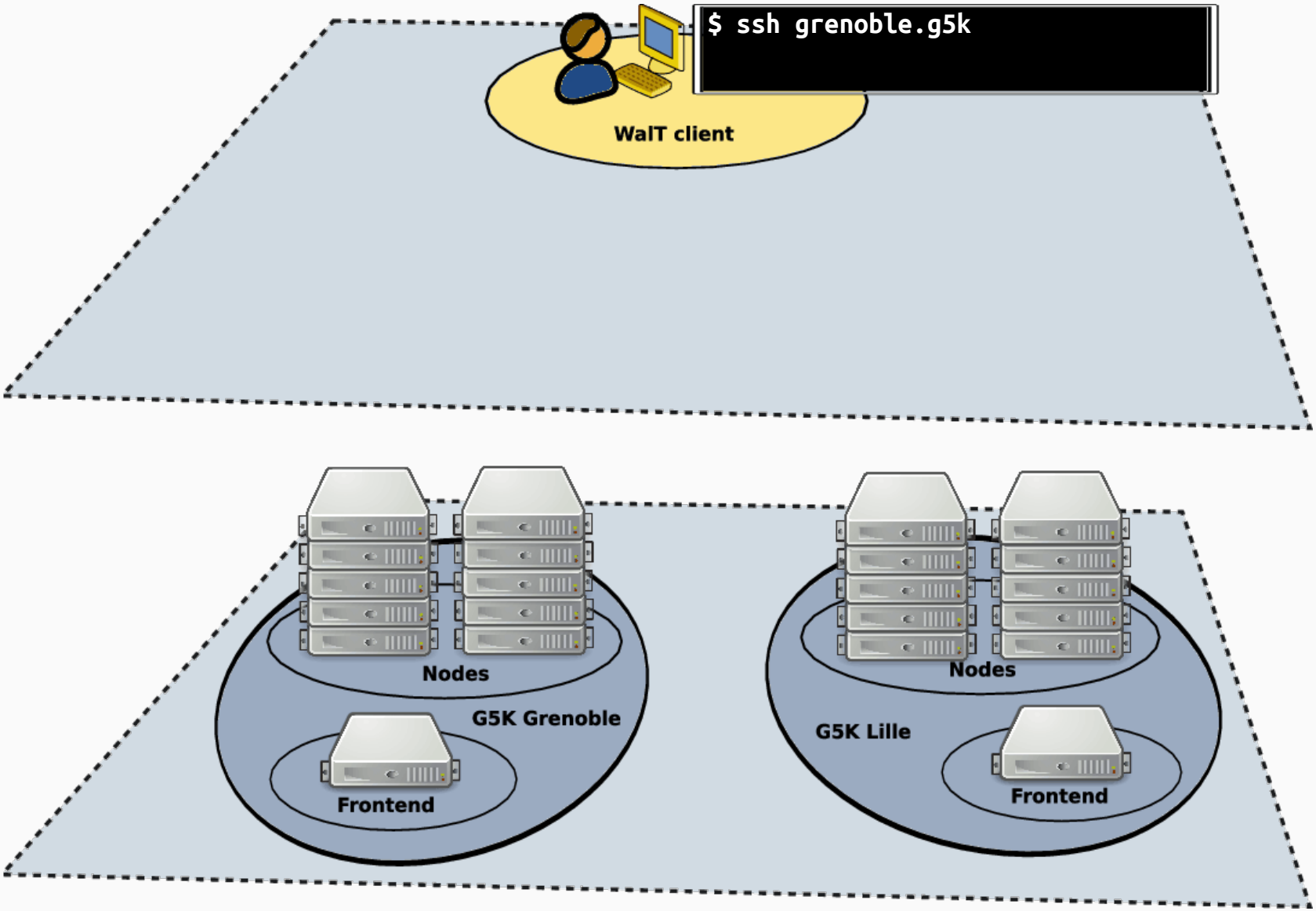

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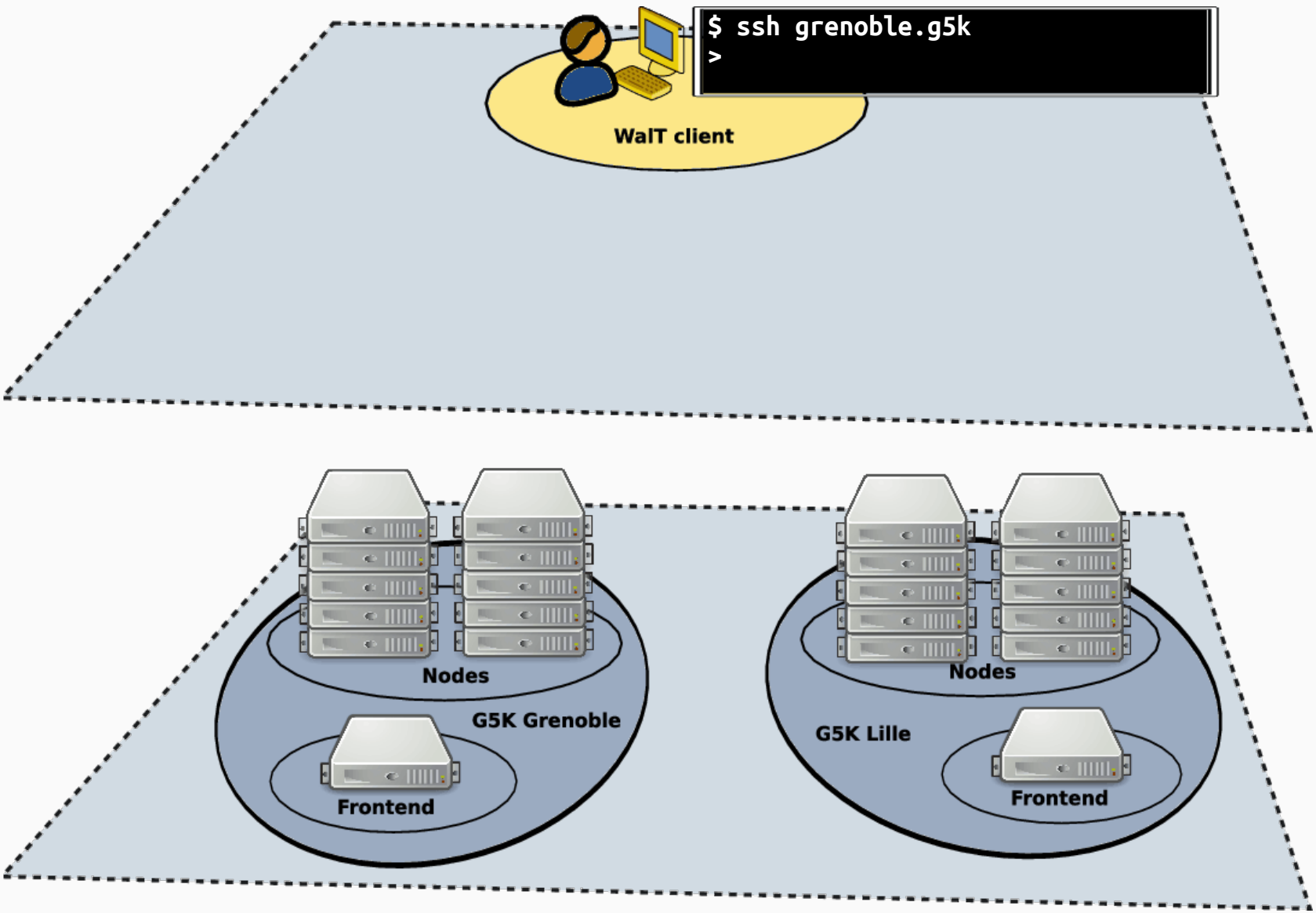

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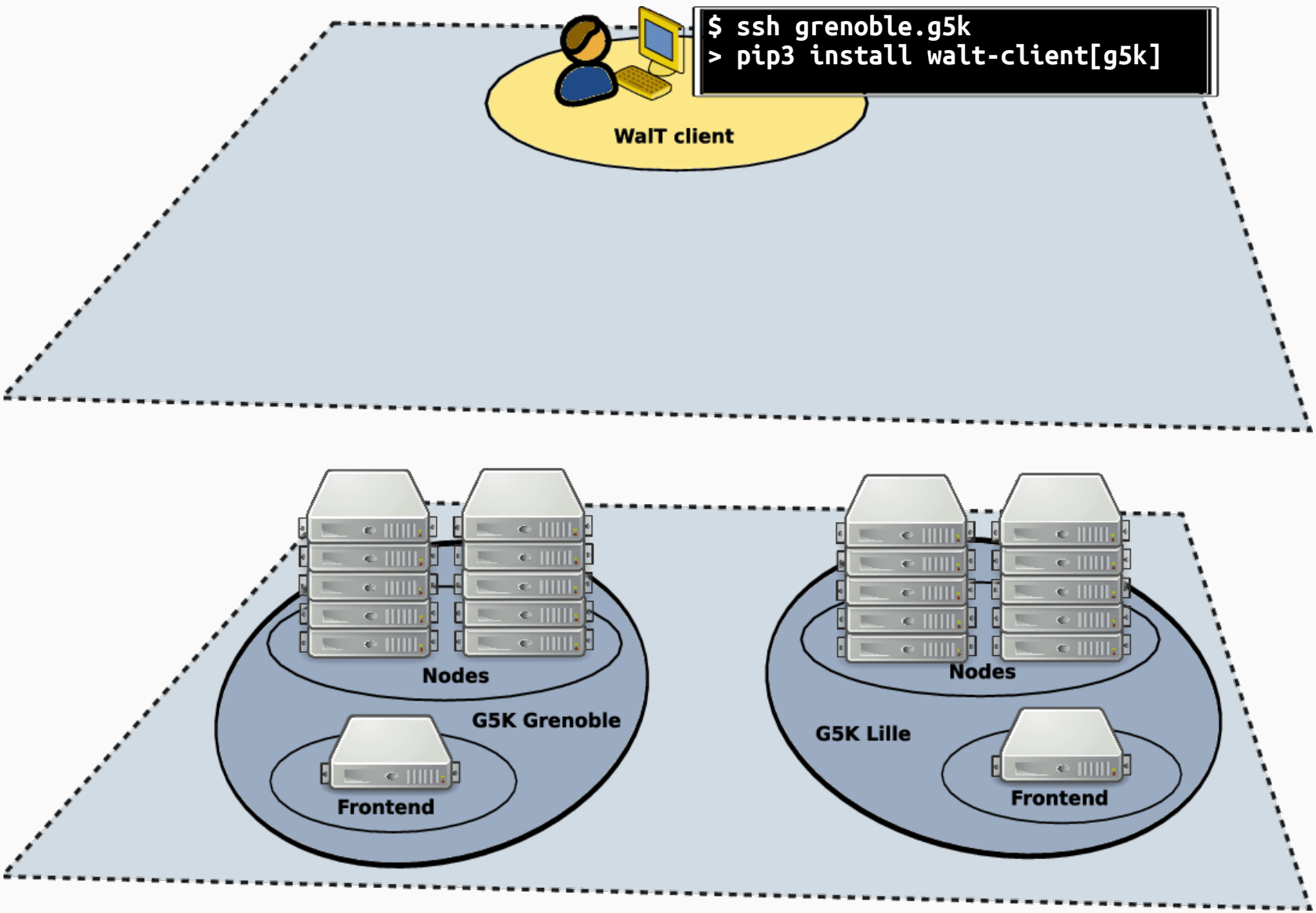

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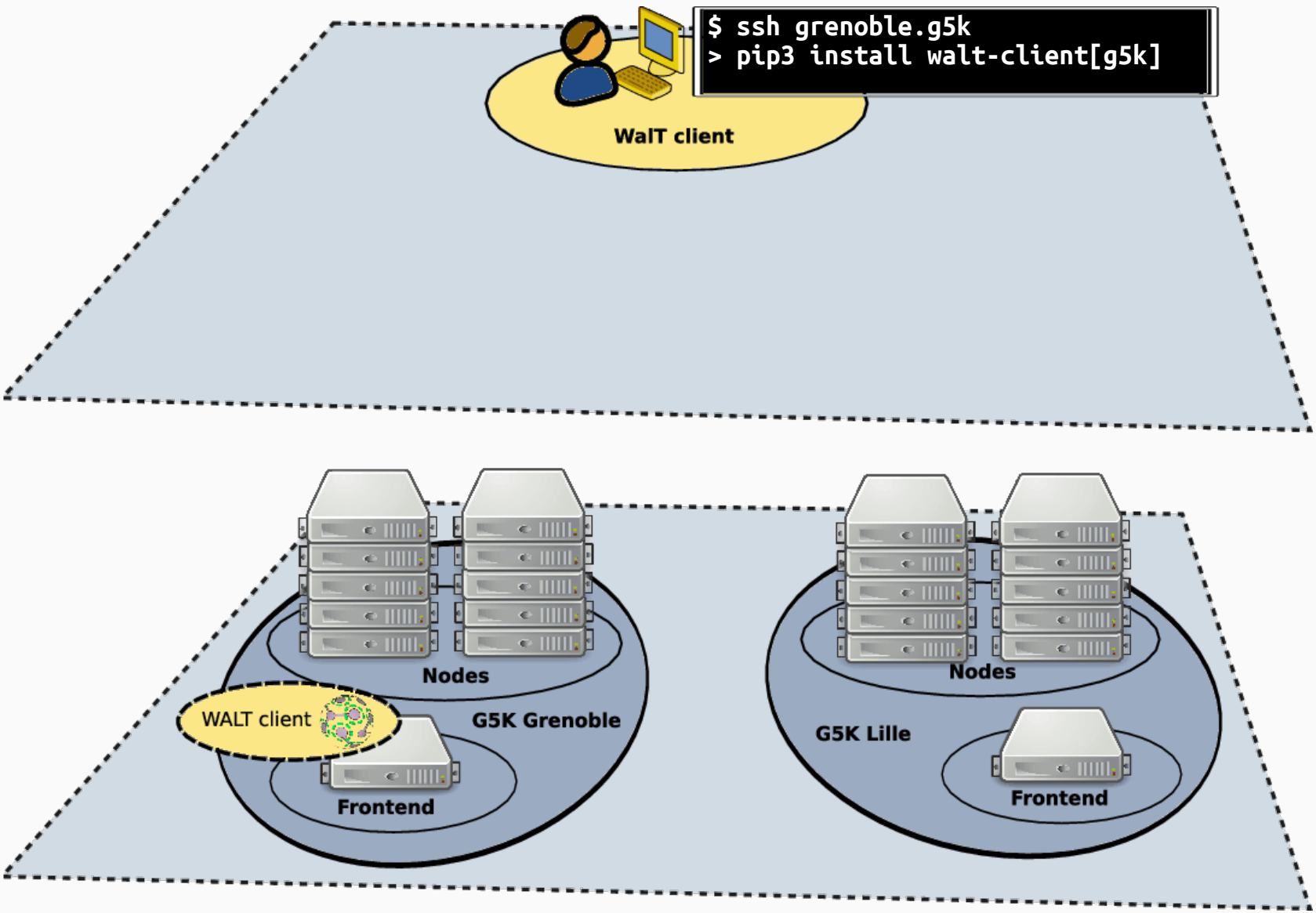

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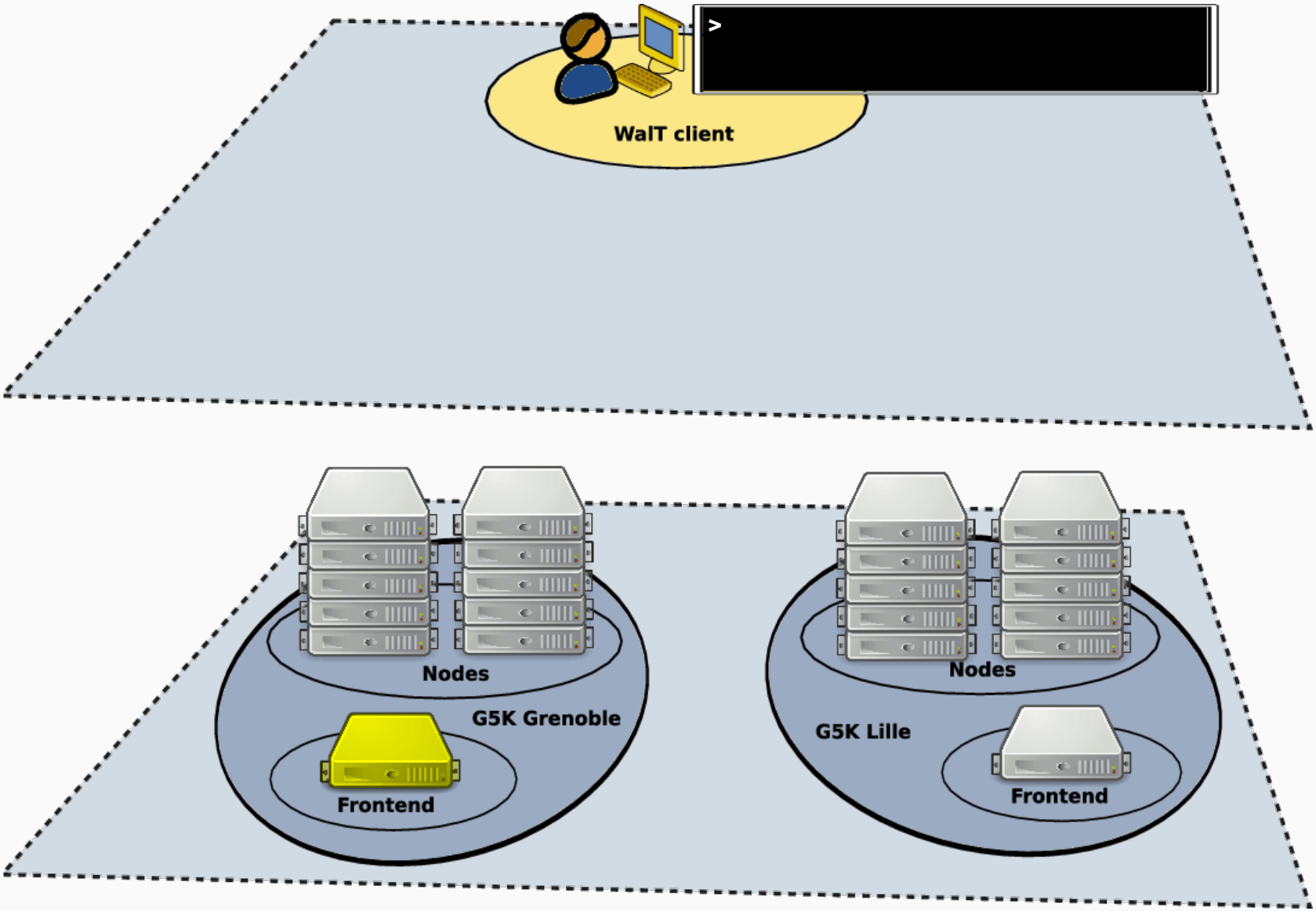

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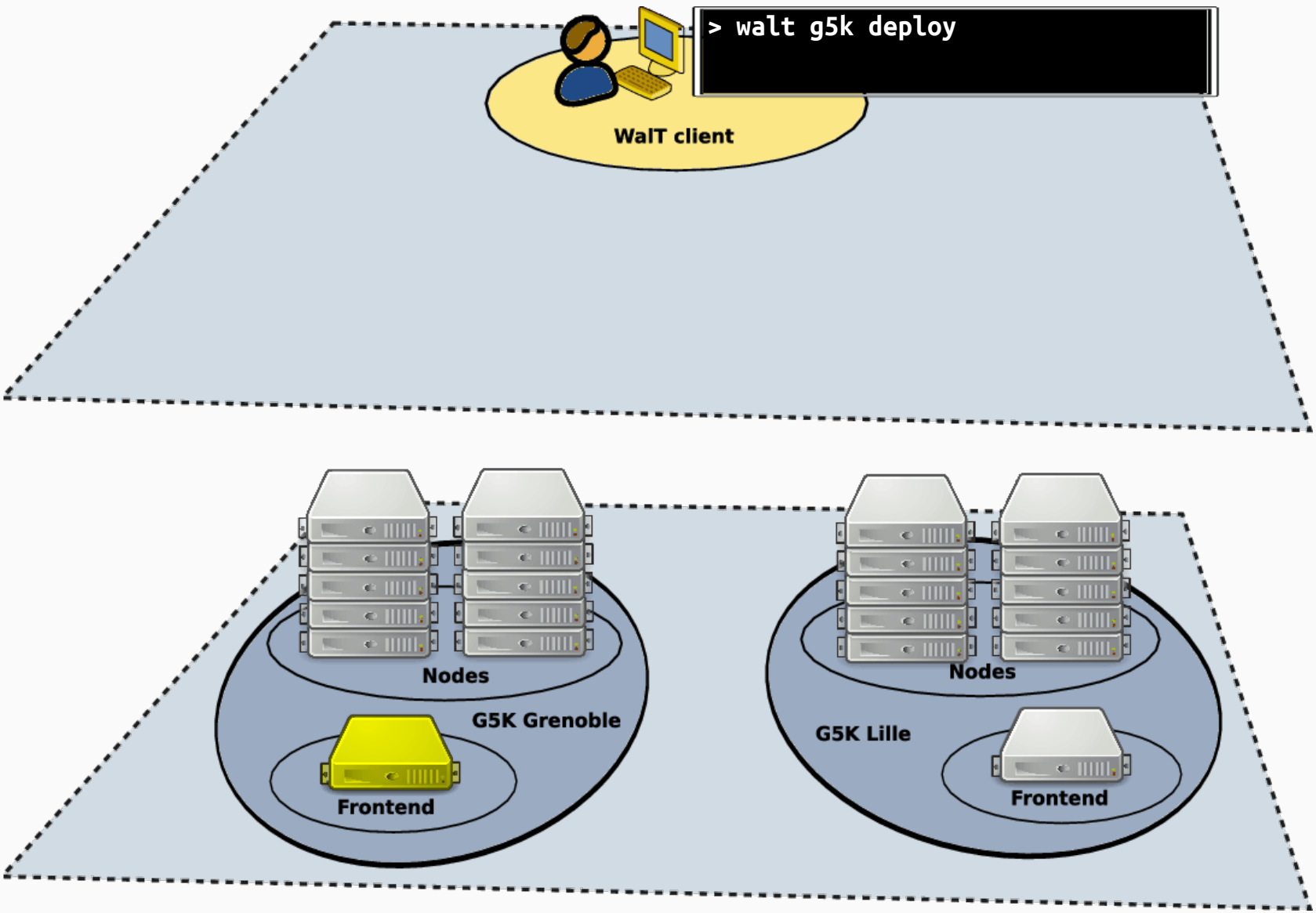

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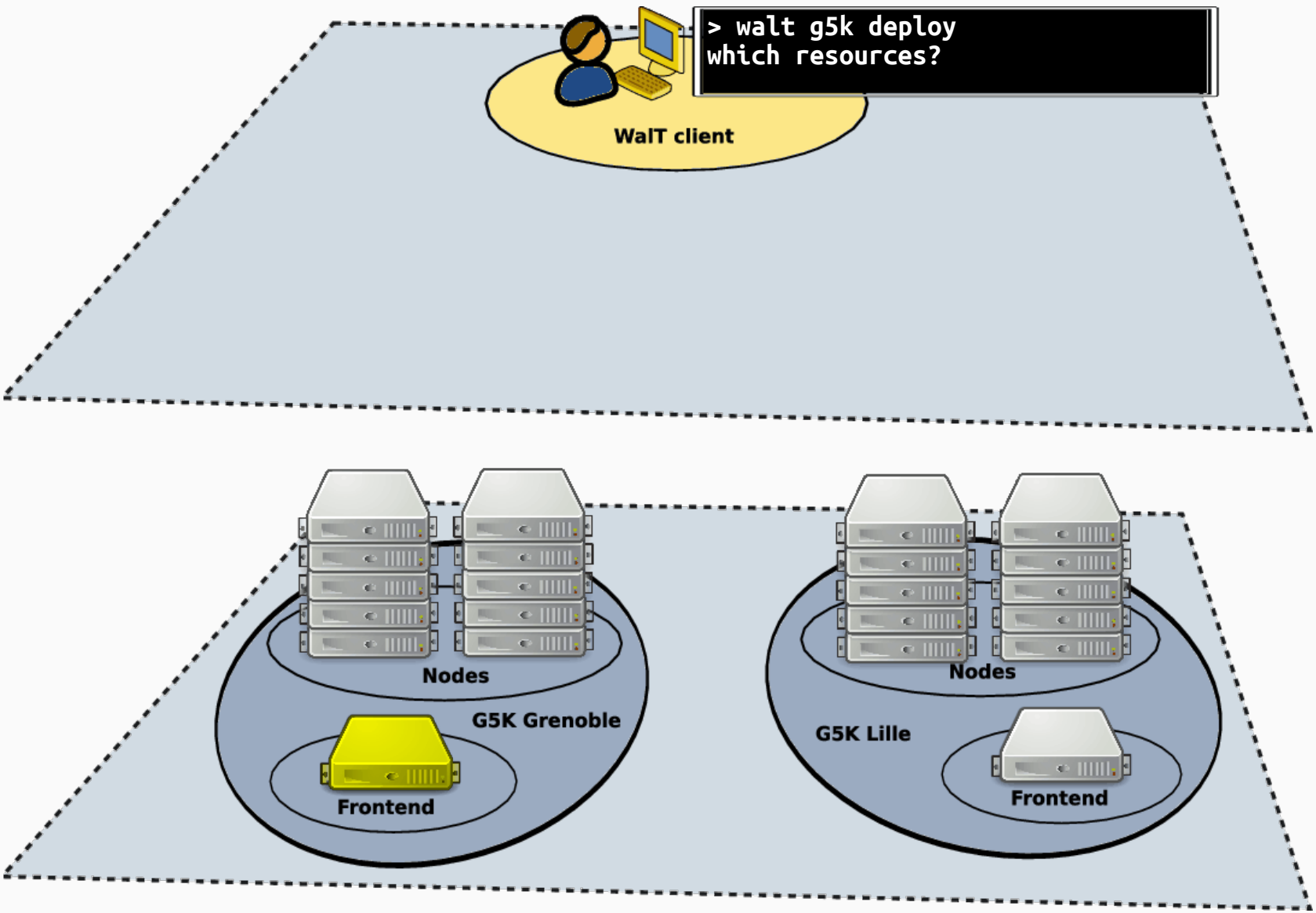

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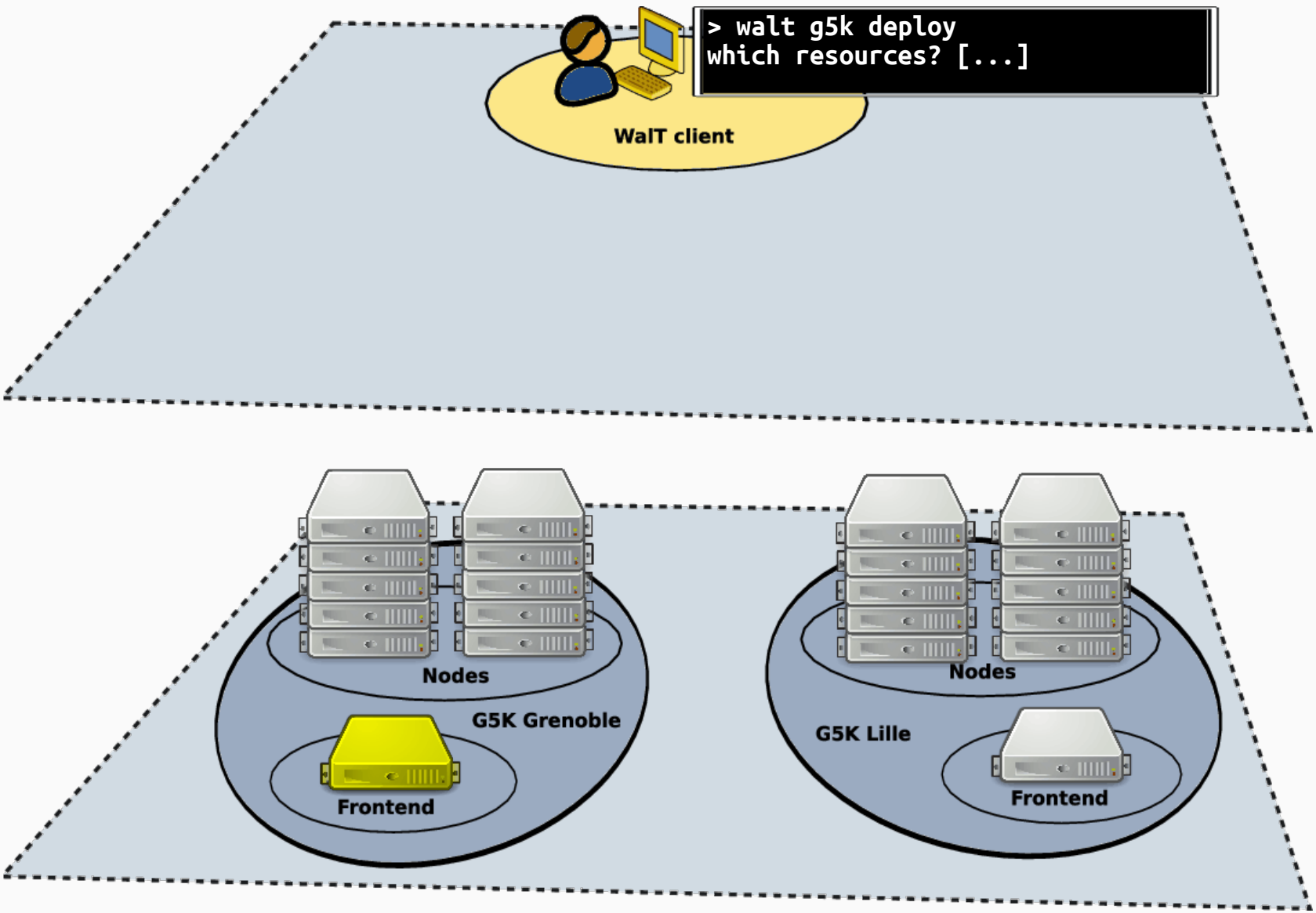

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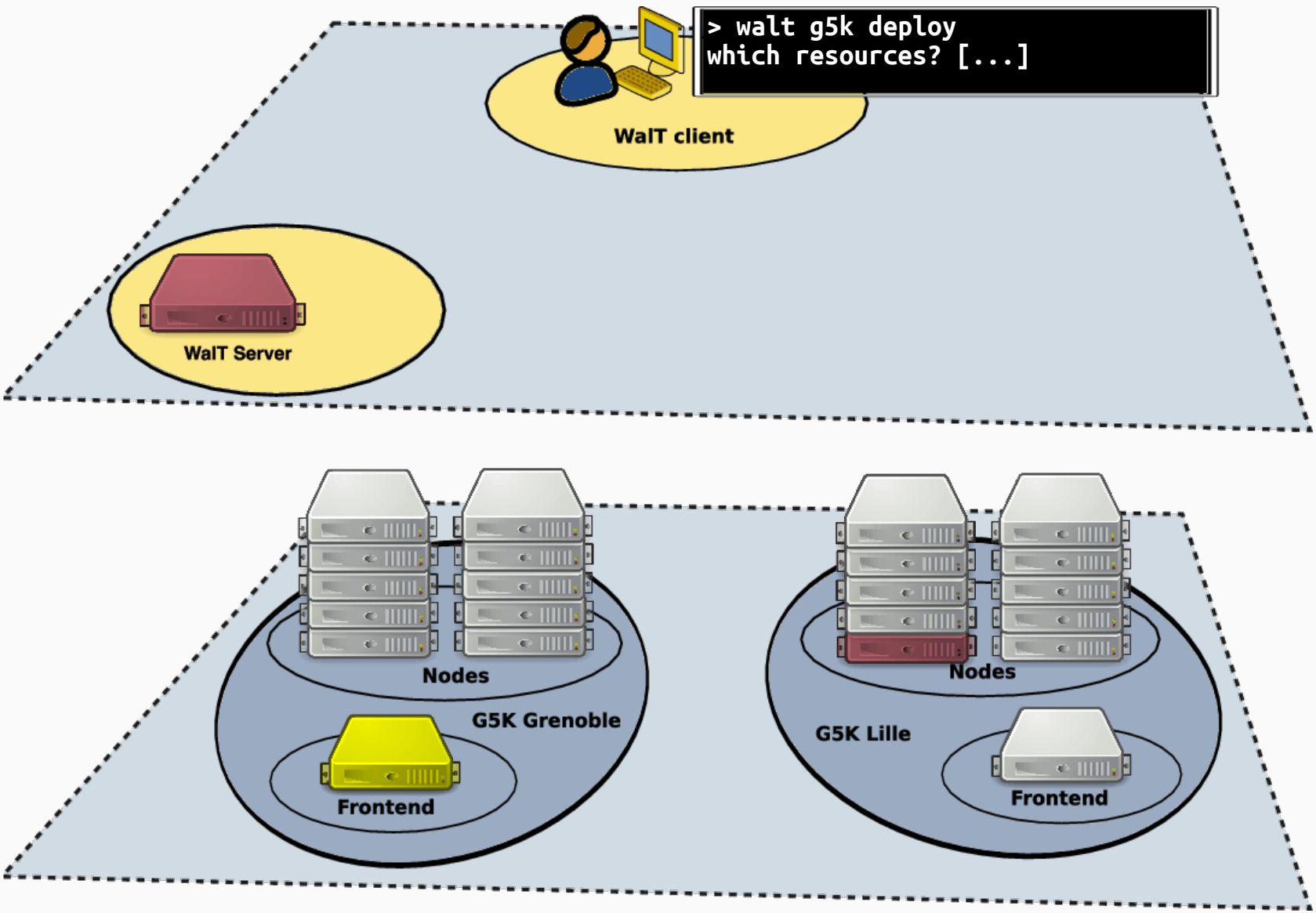

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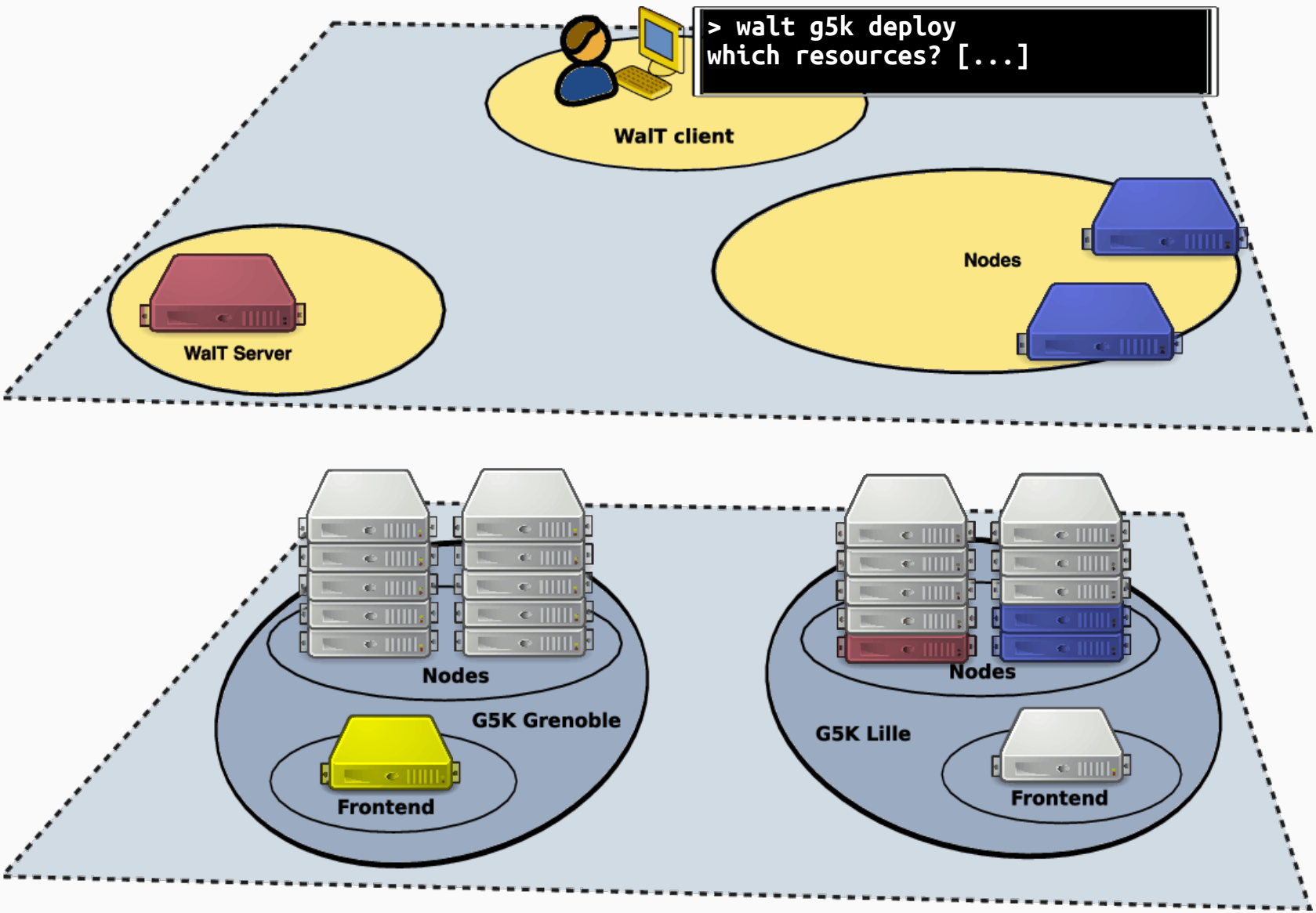

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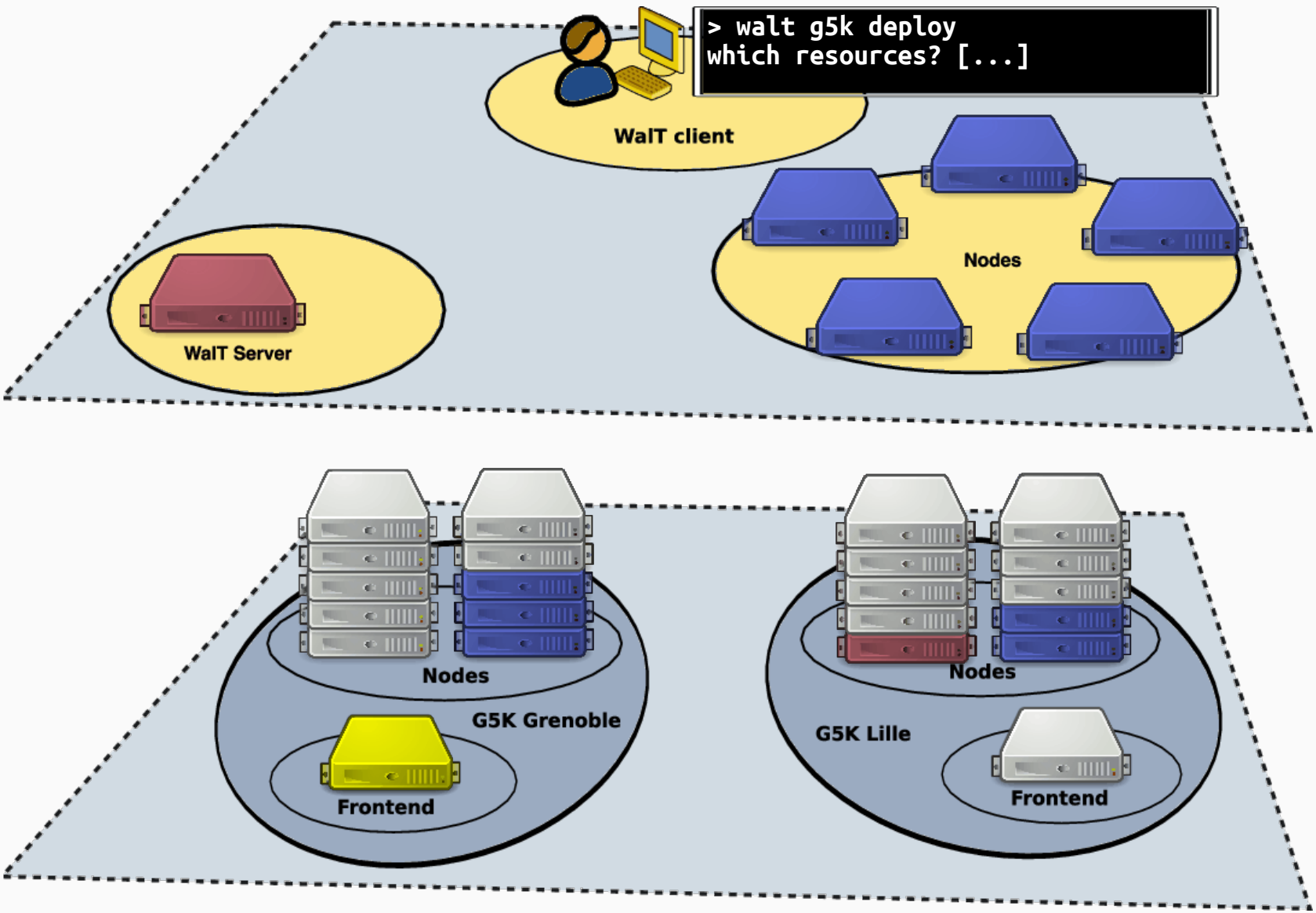

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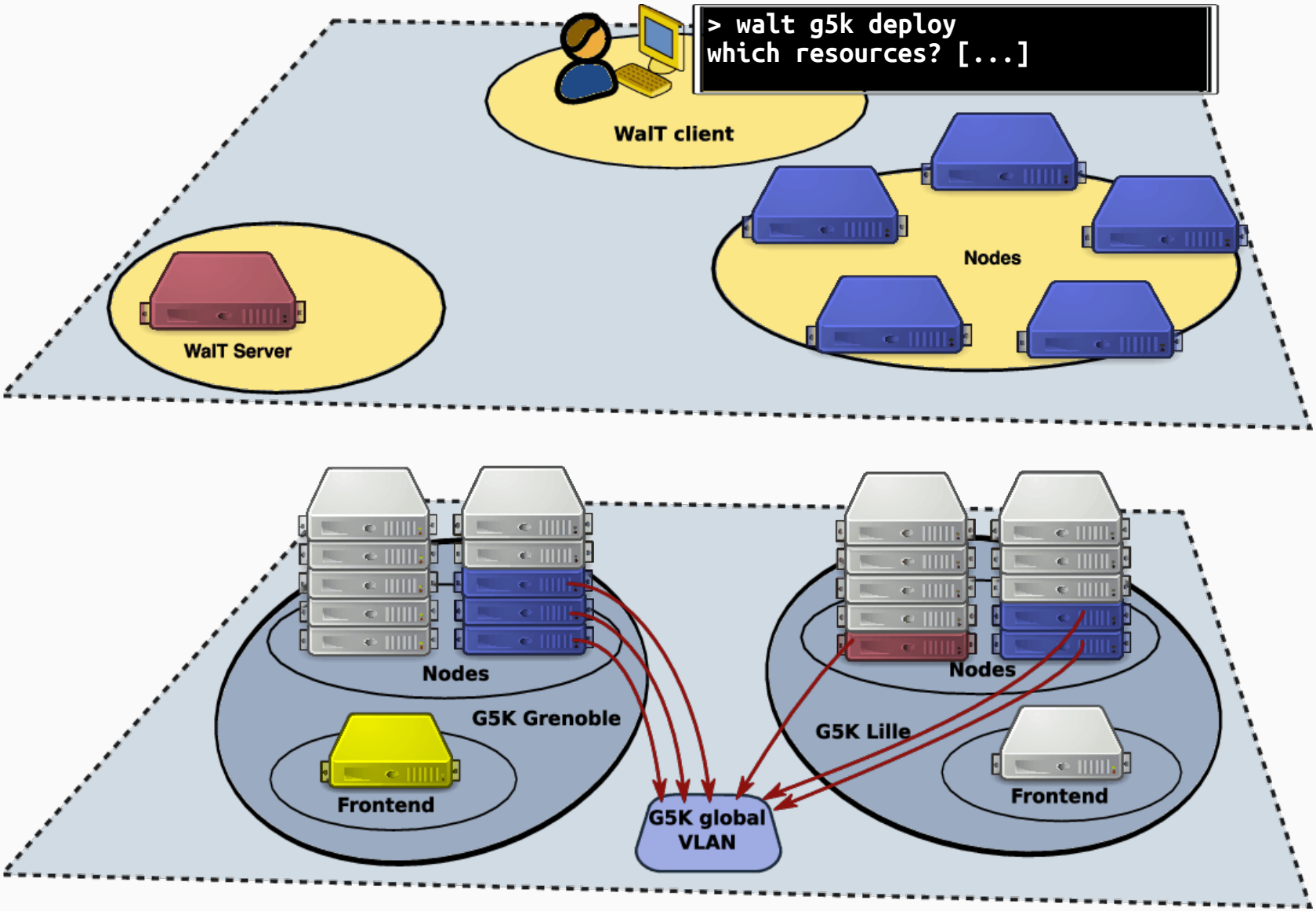

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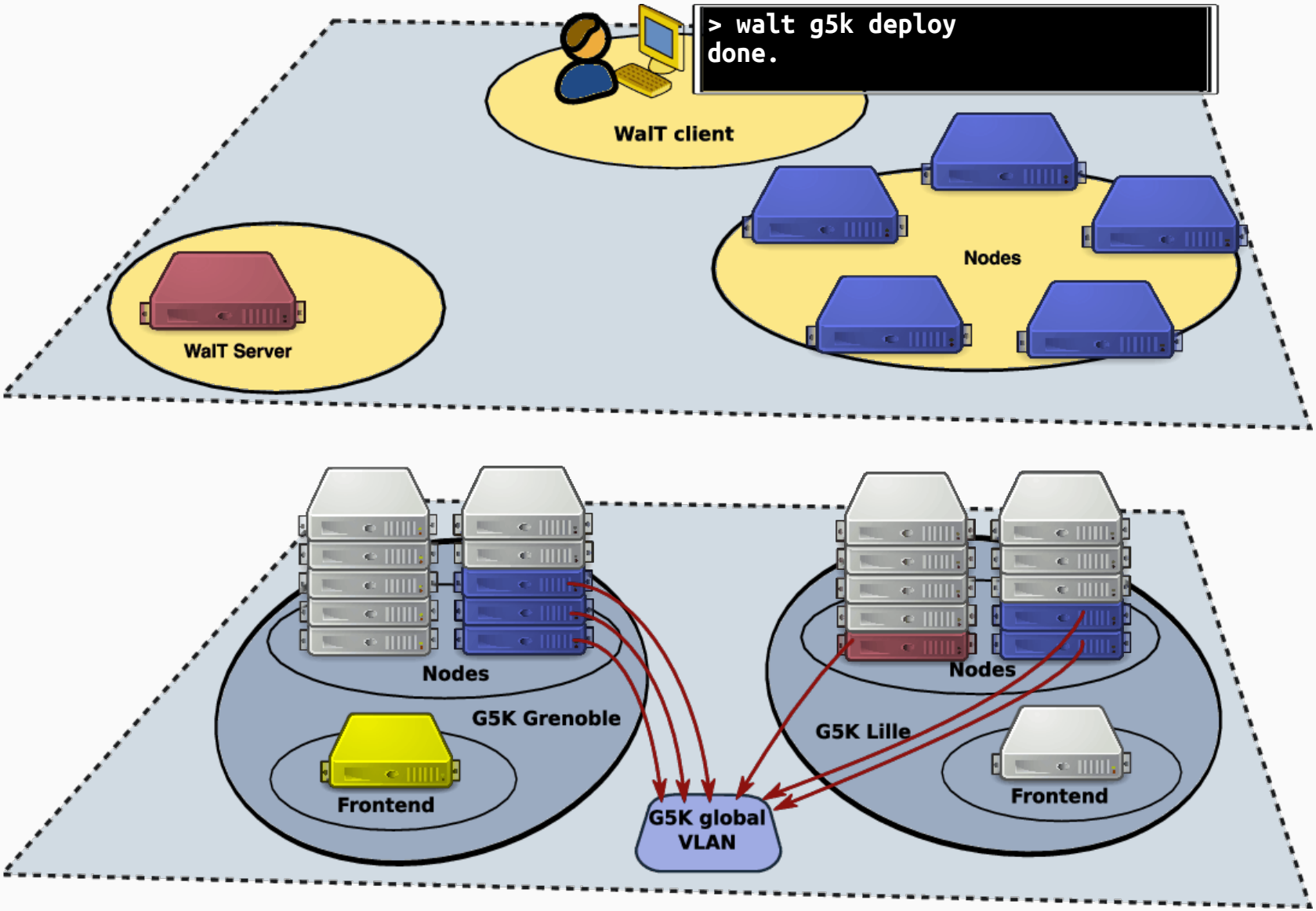

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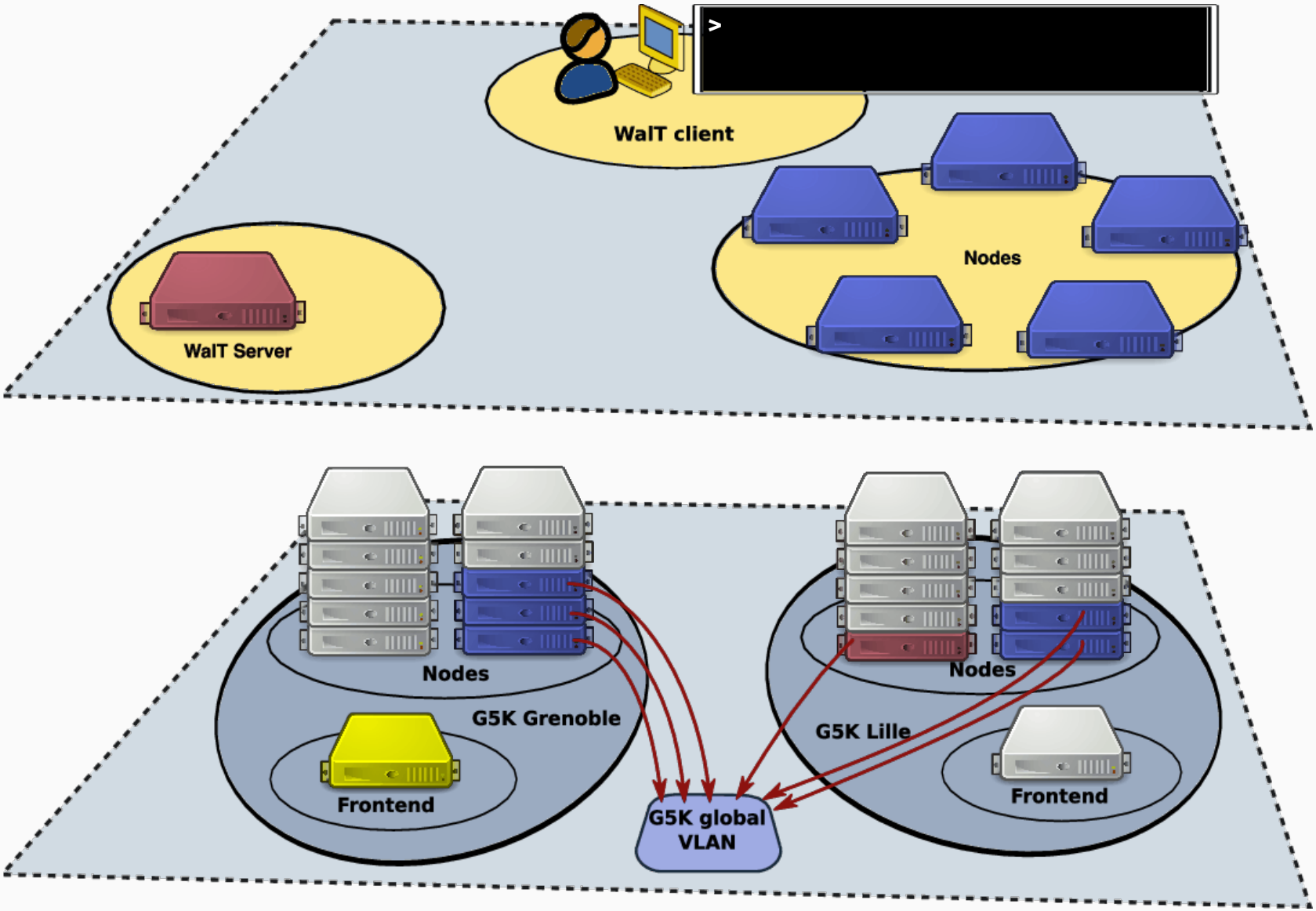

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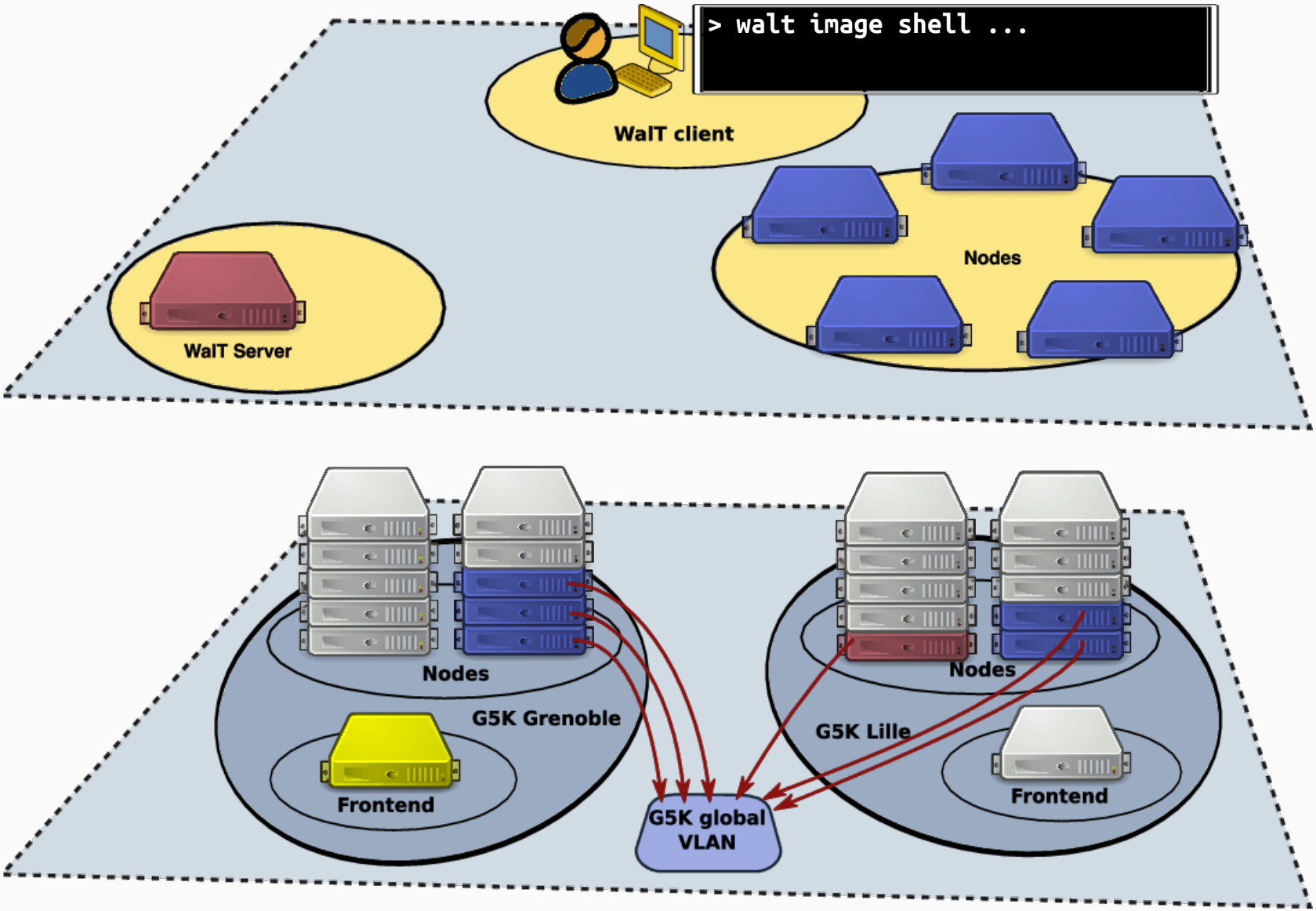

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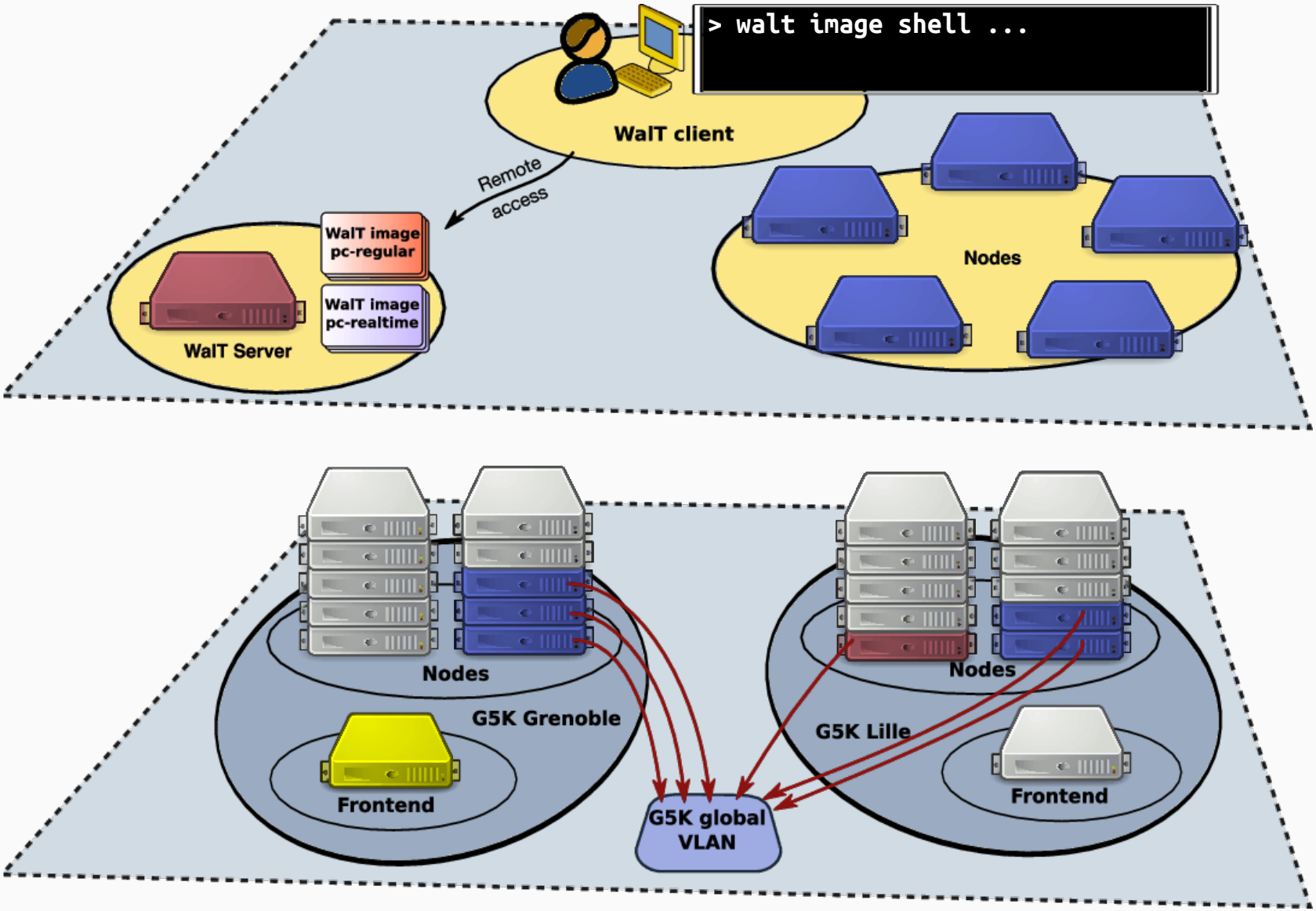

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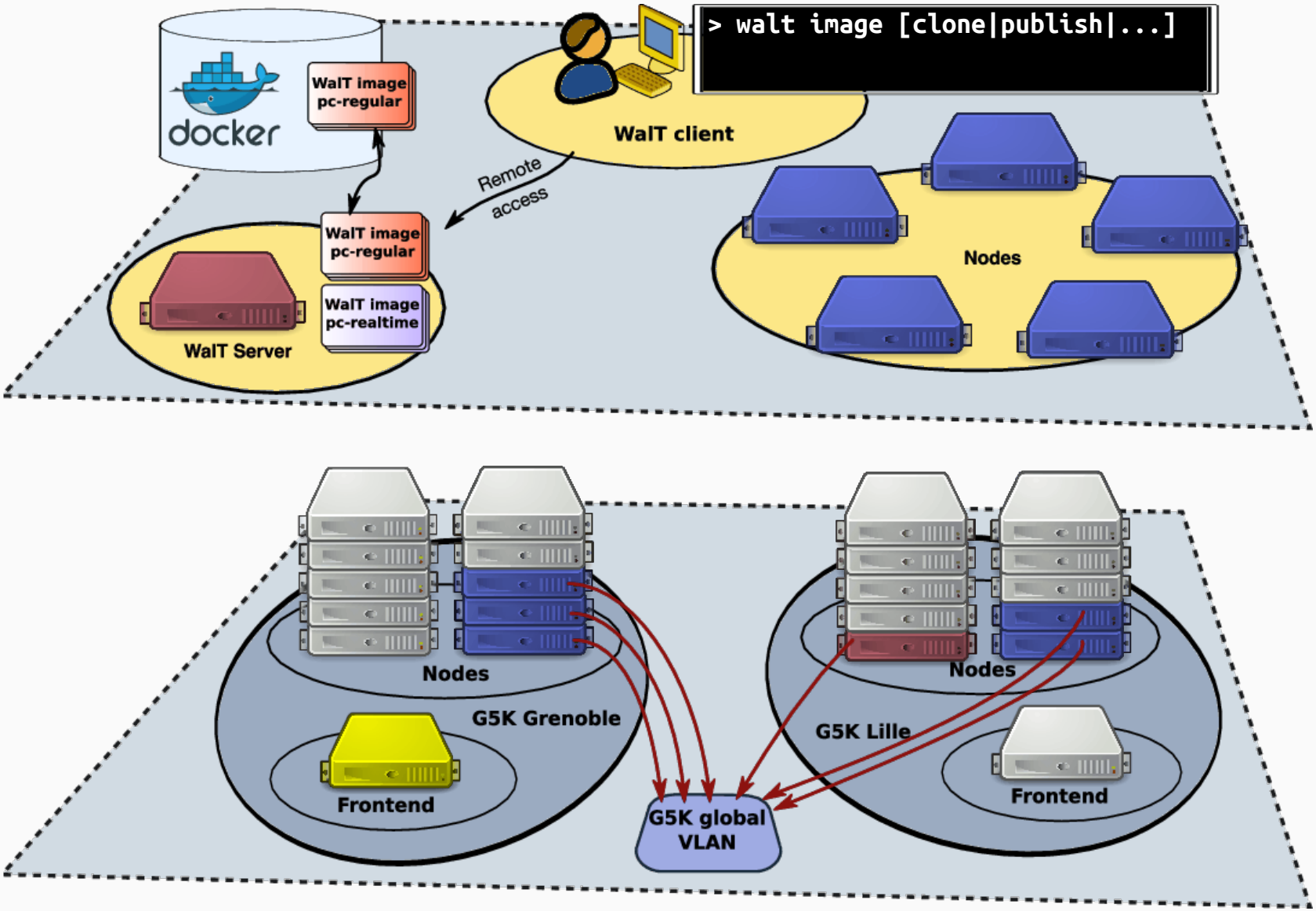

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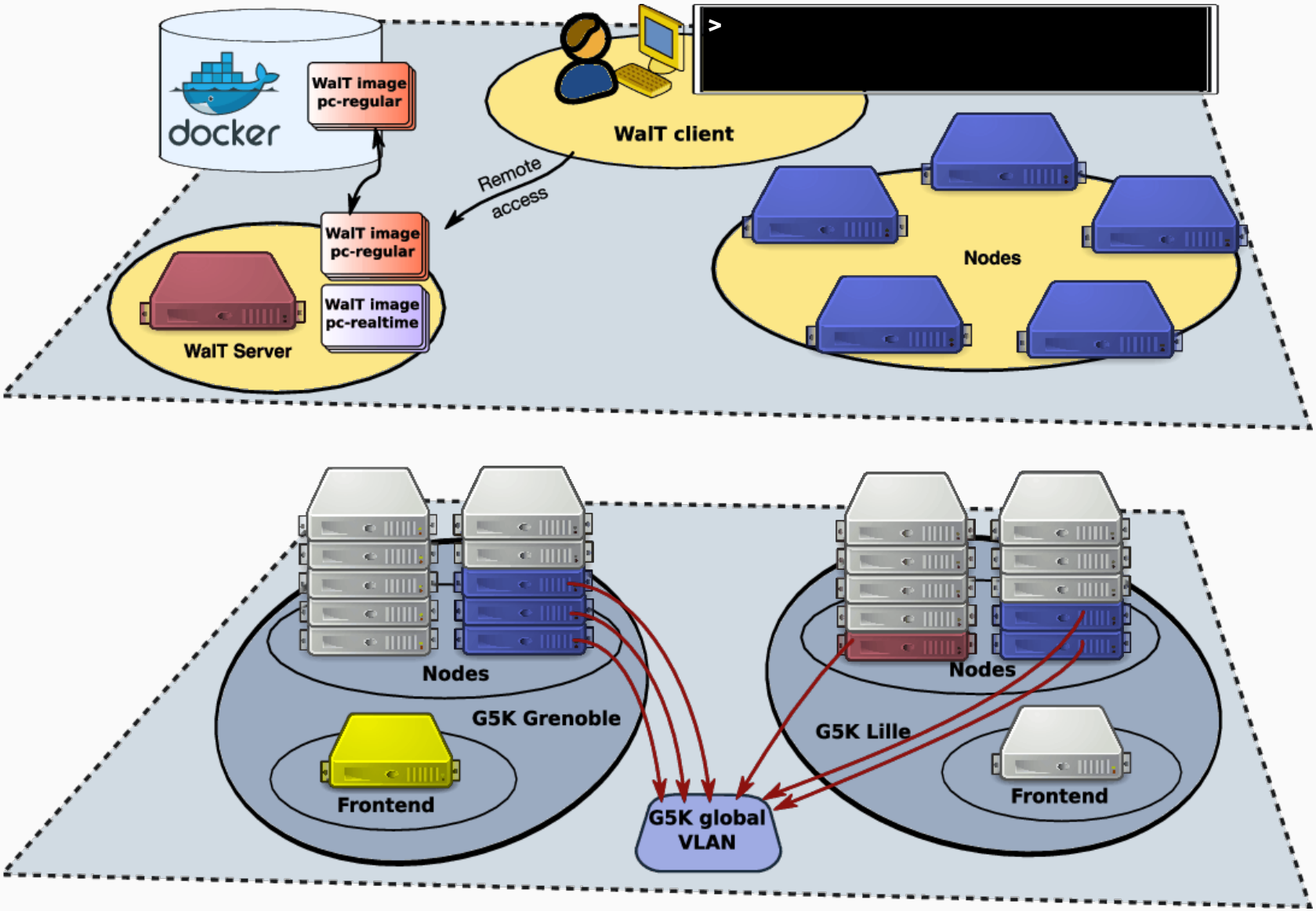

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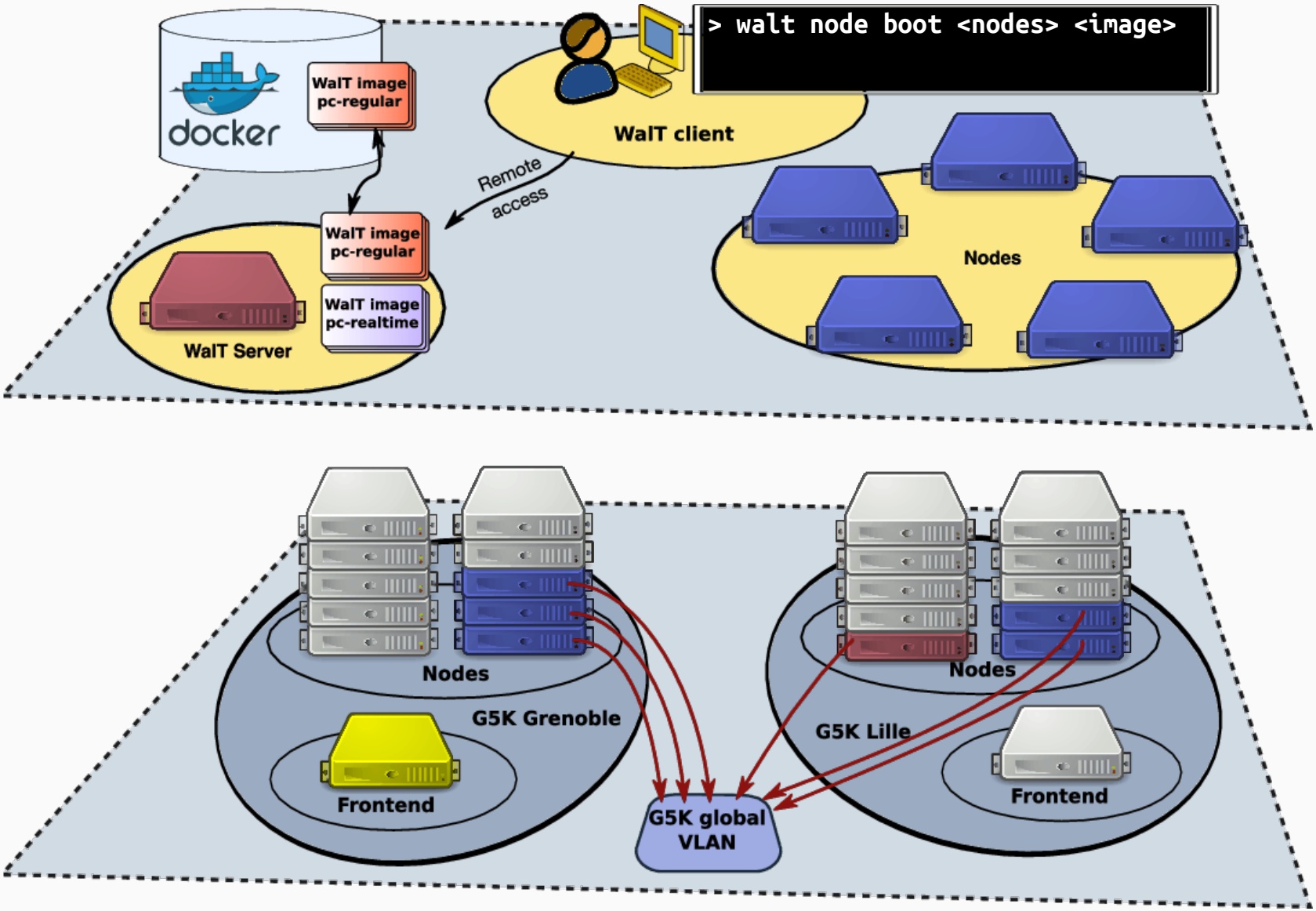

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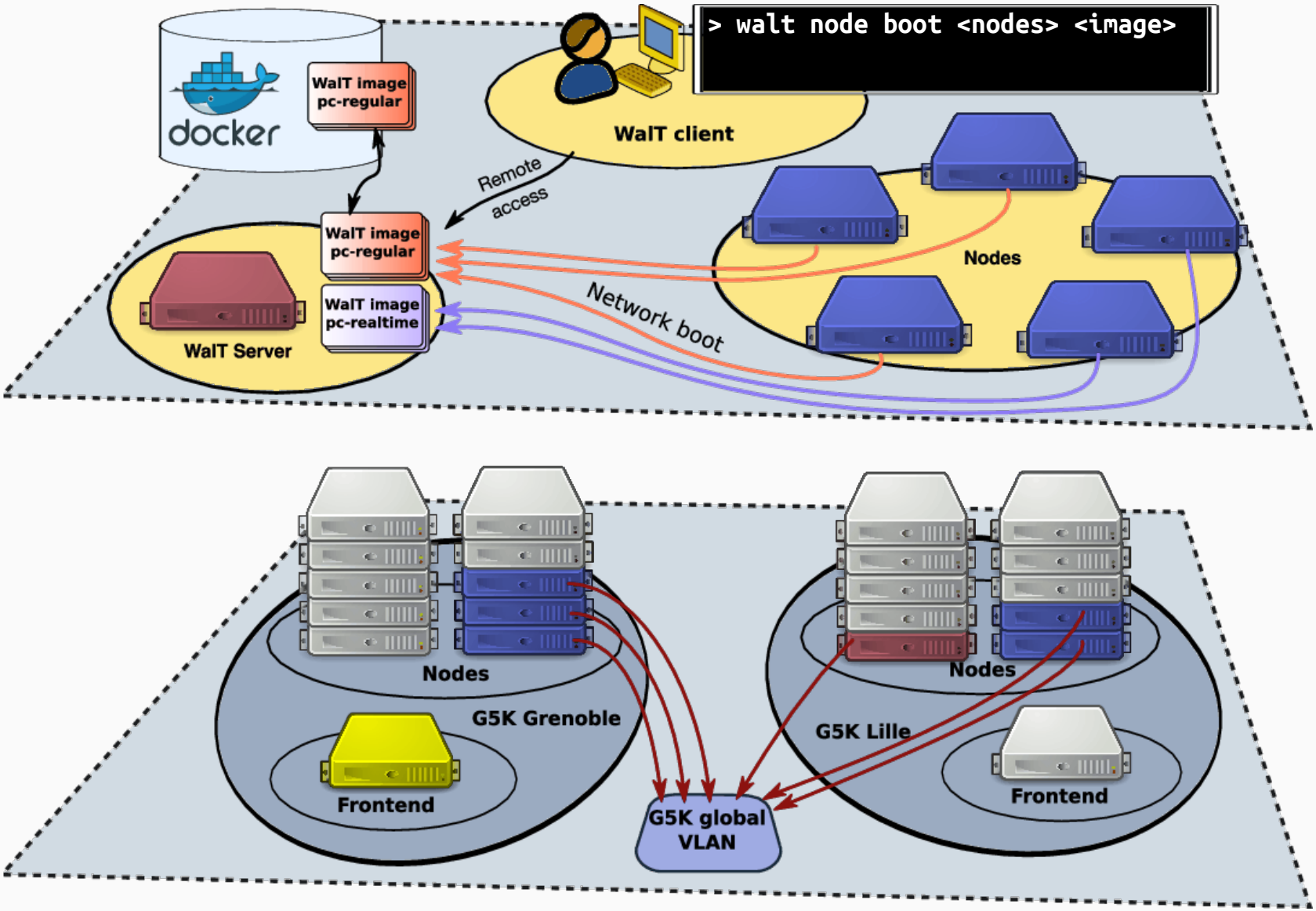

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  - Nodes are usually booted in less than 1 min
    (on a local testbed with Raspberry Pi boards)
- **Reproducibility** is ensured at each node reboot
  - Nodes are stateless
  - Changes made wrt. image files are discarded on reboot

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- Steps, for a light debian OS:

Step	**Description**	**Delay A**
0	Server: Route requests to new image	fast
1	Node: Hardware reboot	≈2min10
2	Node: Network bootloader	fast
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	Total procedure	**≈2min30**

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3	Node: Wait for OS boot	≈15s	≈35s
	Total procedure	**≈2min30**	**≈6min50**

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- Solution: let iPXE **use HTTP instead of TFTP**.

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- Idea: **Kexec** technique can be used to directly boot a new kernel (bypassing hardware reboot)
- Solution:
  - Implement this kexec-boot in `[image]:/bin/walt-reboot`
  - Mimic network bootloader behaviour:
    download and boot the kernel of the new image
    (not the current one!)

WalT node deployment – avoiding hardware reboot

- We now have different steps:

Step	Description	Delay A	Delay B
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About NBFS

- An experimental **network filesystem** I am working on.
- Specialized for **network booting**.
- Uses **speculation**: good performance even when **latency** is high.
- Improves responsiveness after bootup too (e.g. reduced ssh login delay).
- A research paper is being written with R.Lachaize, F.Rousseau, A.Duda.

WalT node deployment – avoiding NFS

- New numbers with NBFS instead of NFS:

Step	Description	Delay A	Delay B
0	Server: Route requests to new image	fast	fast
1	Node (walt-reboot): get kernel & initrd	fast	fast
2	Node (walt-reboot): kexec new kernel	fast	fast
3	Node: Wait for OS boot	≈15s	≈15s
	Total procedure	**≈20s**	**≈20s**

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- Result: **similar delay for remote and local bootup**.

Agenda

Motivation

Sample use case

WalT & fast OS prototyping

OS deployment rework

Related news

Related news

- **NBFS** is still **experimental**
- **WalT-on-G5K** feature planning:
  - available with **WALT version 8** (end of june)
  - **NBFS** will **not** be included
  - we are discussing with G5K team for improvements / documentation etc.
- G5K team is working on improving `kadeploy` with **kexec** too (near future)

More info:

WalT-on-G5K demo:	https://vu.fr/walt-on-g5k
WalT website:	https://vu.fr/walt
Questions, WalT training requests:	etienne.duble@imag.fr