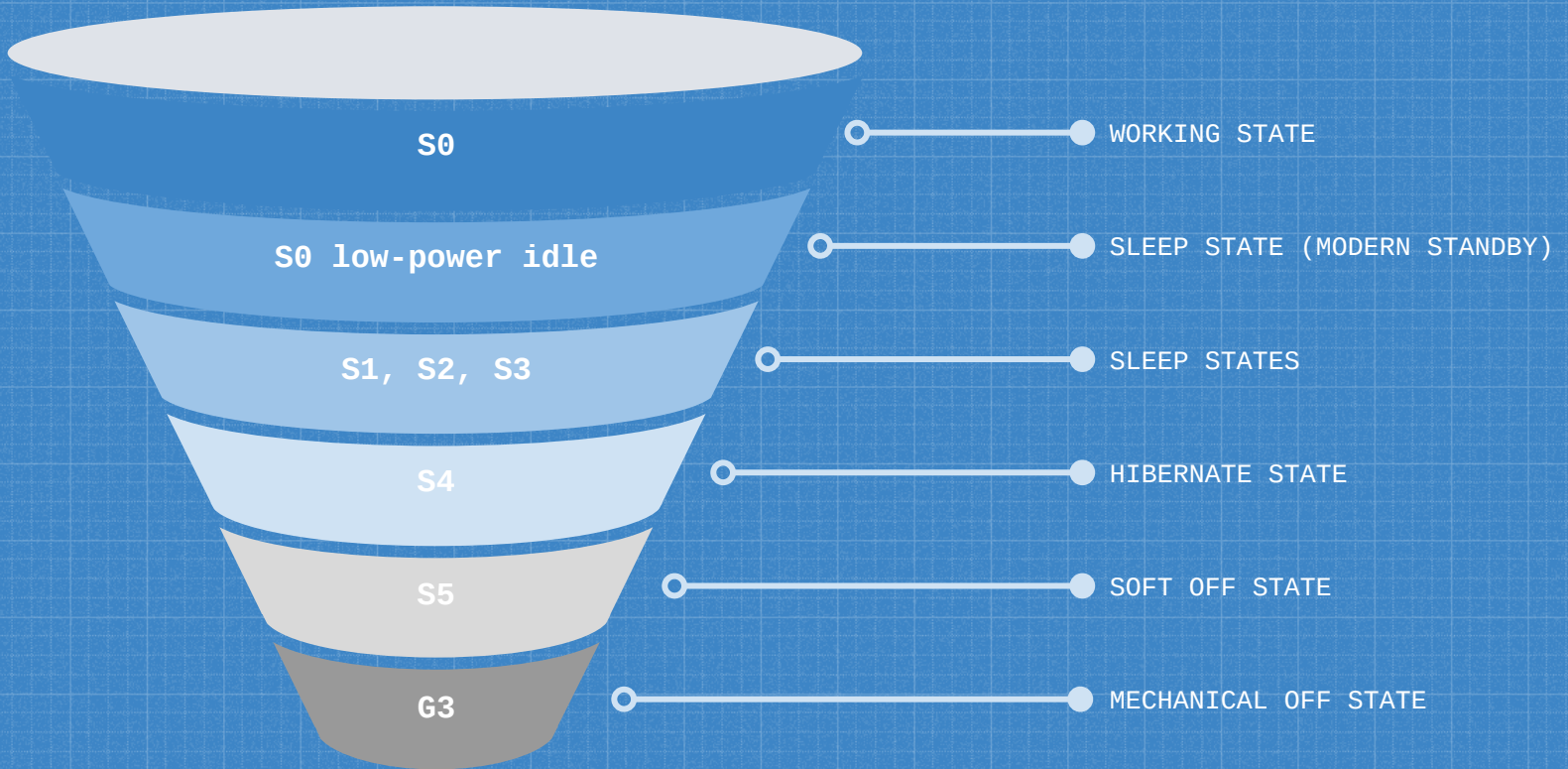# SYSTEM POWER STATES

Sophie Goldstein

CSCI 432 Operating Systems
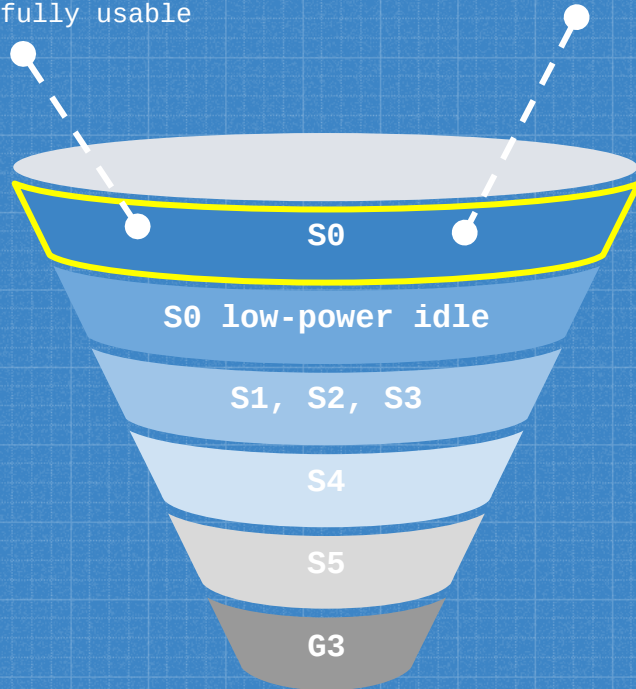
Advanced Configuration and Power Interface (ACPI) Power States

- S0 — WORKING STATE
- S0 low-power idle — SLEEP STATE (MODERN STANDBY)
- S1, S2, S3 — SLEEP STATES
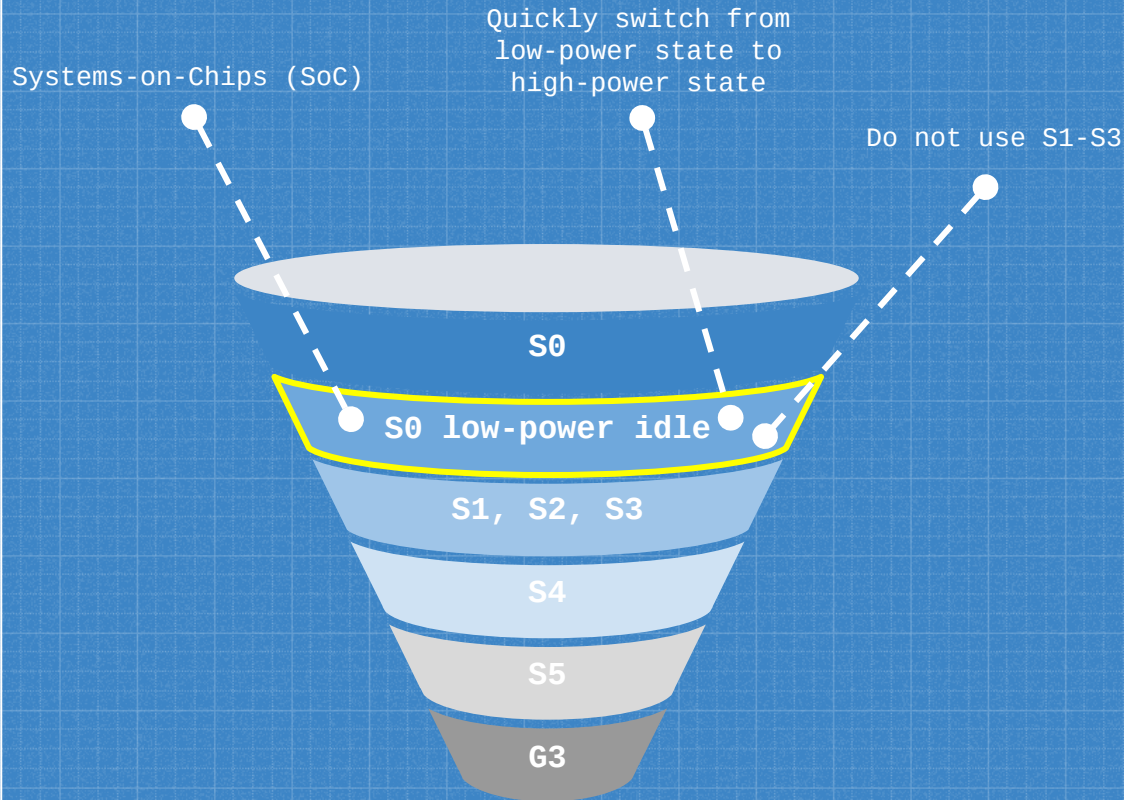- S4 — HIBERNATE STATE
- S5 — SOFT OFF STATE
- G3 — MECHANICAL OFF STATE

Working State (S0)

Hardware components not in use can save power by entering a lower power state

System is fully usable

S0

S0 low-power idle

S1, S2, S3

S4

S5

G3

Sleep State (Modern Standby)

Systems-on-Chips (SoC)

Quickly switch from low-power state to high-power state

Do not use S1-S3

S0

S0 low-power idle

S1, S2, S3

S4

S5

G3

Sleep State (S1, S2, S3)

System appears to be off

Systems typically support one of these states, but not all three

Volatile memory kept to maintain system state

Some components remain powered to wake from input from the keyboard, LAN, or USB device

S0

S0 low-power idle

S1, S2, S3

S4

S5

G3
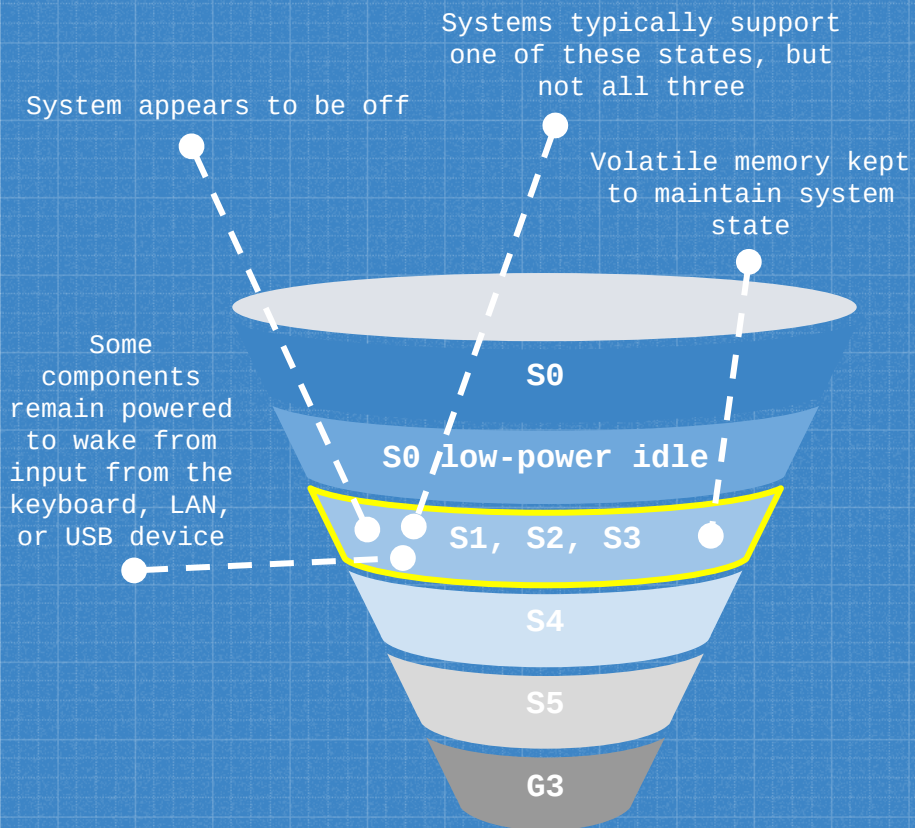
POWER CONSUMPTION

Processor clock off

No more than 2 seconds

HARDWARE LATENCY

S1

SOFTWARE RESUMPTION

Restarts where left off

All context retained & maintained by hardware

SYSTEM HARDWARE CONTEXT

POWER CONSUMPTION

Processor is off

2 seconds or more

HARDWARE LATENCY

S2

SOFTWARE RESUMPTION

Starts from processor's reset vector

CPU context & system cache contents are lost

SYSTEM HARDWARE CONTEXT

POWER CONSUMPTION

Processor is off
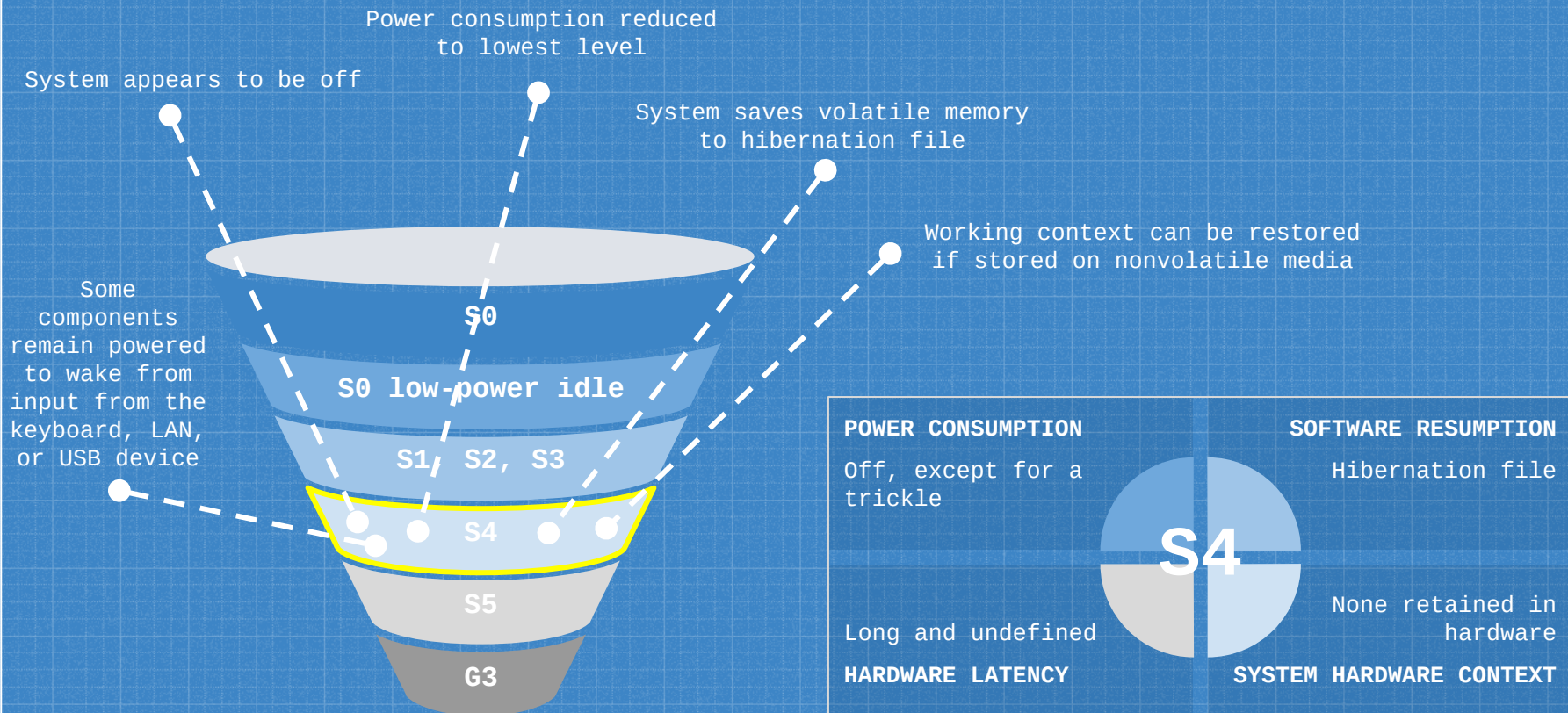
2 seconds or more

HARDWARE LATENCY

S3

SOFTWARE RESUMPTION

Starts from processor's reset vector

Only system memory is retained

SYSTEM HARDWARE CONTEXT

Hibernate State (S4)

Power consumption reduced to lowest level

System appears to be off

System saves volatile memory to hibernation file

Working context can be restored if stored on nonvolatile media

Some components remain powered to wake from input from the keyboard, LAN, or USB device

S0

S0 low-power idle

S1, S2, S3

S4

S5

G3

POWER CONSUMPTION

Off, except for a trickle

SOFTWARE RESUMPTION

Hibernation file

S4

Long and undefined

HARDWARE LATENCY

None retained in hardware

SYSTEM HARDWARE CONTEXT

Soft Off State (S5)

System appears to be off

Full shutdown and boot cycle

S0

S0 low-power idle

S1, S2, S3

S4

S5

G3
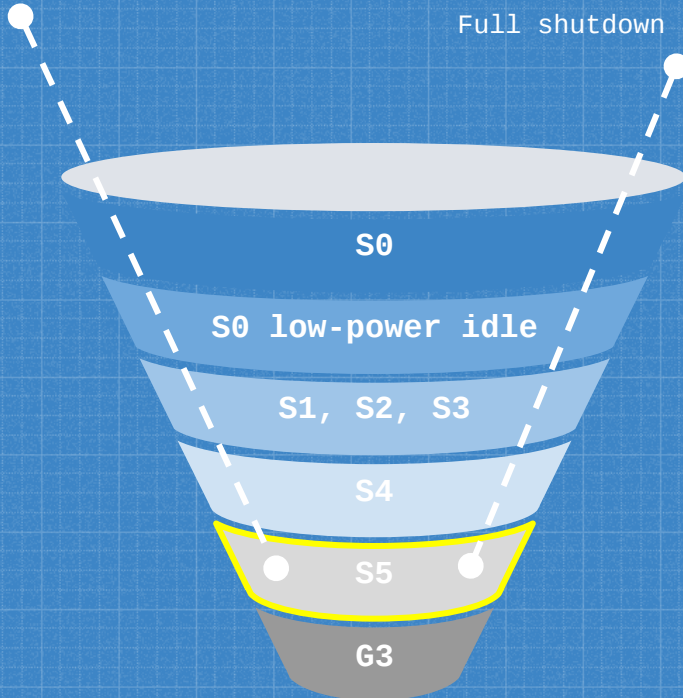
POWER CONSUMPTION

Off, except for a trickle

SOFTWARE RESUMPTION

Boot is required

S5

Long and undefined

None retained
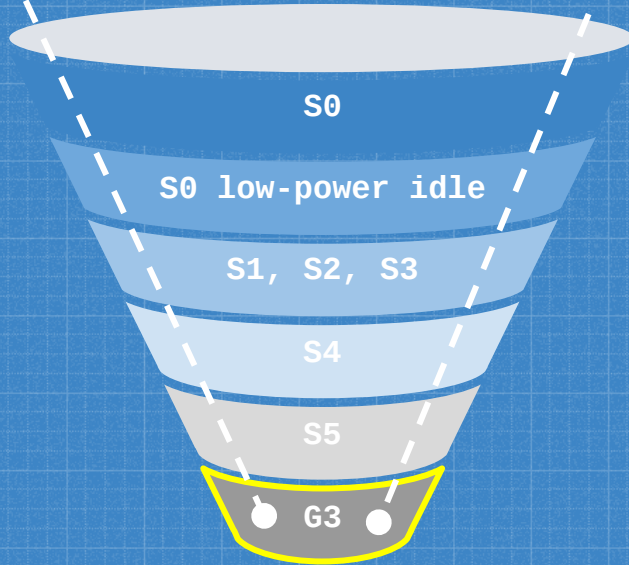
HARDWARE LATENCY

SYSTEM HARDWARE CONTEXT

Mechanical Off State (G3)

System is completely off and consumes no power

System returns to working state only after full reboot

S0

S0 low-power idle

S1, S2, S3

S4

S5

G3

RESOURCES

System Power States
System Sleeping States
System Shutdown State S5
System Wake-up Events

For a full list
of resources,
contact Sophie