Wakeup Sources

Linux Device Drivers

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What is a “wakeup source”?

A “wakeup source”:

- Can cause a platform to exit suspend
- Device interrupt, or interrupt-capable GPIO
- Details are highly machine- and platform-specific

What is a “wakeup source”?

Common examples:

- “Power button”
- Volume up/down keys
- Cable insertion
- Real-time clock
- Wake-on-LAN

Driver Considerations

Watch out!

- Pins are not magically wakeup-capable
- The kernel APIs inform, but do not implement
- The user may have some say in the matter

device_may_wakeup()

```
int foo_suspend(struct device *dev)
{
  struct foo *f = dev_get_drvdata(dev);
  ...
  if (device_may_wakeup(dev)) {
    enable_irq_wake(foo->irq);
  } else {
    ...
  }
```

`device_may_wakeup()`

The `else` is potentially tricky:

- Don’t power the device down
- Don’t turn off peripheral clocks
- DON’T race with interrupt handlers!
- DON’T race with kernel threads, workers, ...!

device_may_wakeup()

```
} else {
  disable_irq_nosync(foo->irq);
  rc = cancel_delayed_work_sync(&foo->work);
  if (rc) {
    /* we missed the interrupt worker, take note */
    /* (clear interrupt flags in hardware, etc.) */
    /* ... */
  }
  enable_irq(foo->irq); /* (stay balanced!) */
  regulator_disable(foo->vdd);
  ...
}
```

device_may_wakeup()

```
int foo_resume(struct device *dev)
{
  struct foo *f = dev_get_drvdata(dev);
  ...
  if (device_may_wakeup(dev)) {
    disable_irq_wake(foo->irq);
  } else {
    ...
  }
  ...
}
```

device_may_wakeup()

More caution needed:

- The interrupt handler runs before `resume()`
- Some of your resources might not be available yet e.g. `i2c`
- Your interrupt workers may race with your `resume()`

```
struct foo {
  ...
  int is_suspended;
  int is_pending;
}
```

device_may_wakeup()

```
void worker(struct foo *f)
{
  if (f->is_suspended) {
    f->is_pending = 1;
    return;
  }
  do_work(f);
}
```

device_may_wakeup()

```
int resume(struct device *dev)
{
   ...
   if (f->is_pending)
      do_work(f);
   ...
}
```

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