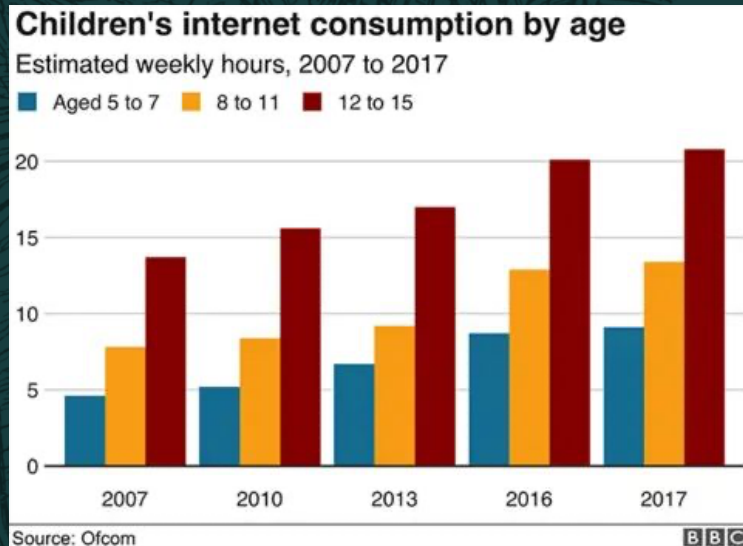


AO: Raffa

Our world cares for children, so we give them smartphones: for communication, tracking, and safety.

In that time, literacy and attention span have plummeted, and loneliness has peaked. Even adults struggle to manage the pull of apps designed to addict.

We see the search for “digital minimalism” and nostalgia for tech that augments the user’s experience in the world, instead of replacing it.



Roberts, M. (2019, January 28). Screen Time "may harm toddlers." BBC News.
<https://www.bbc.com/news/health-47026834>

Use Case



Built for children
(safe, simple, and fun)



Connected
(but not online)



Existing App Library
(via PalmOS ABI)

ECE Areas: Software Systems + Circuits

Requirements

- Local, trusted P2P communication with range of **5km**
 - Make sound to notify user
- GPS and device status updates every **30s**
 - positioning accuracy of **3m**
- Be able to install and run PalmOS applications from PalmDB
- Idle battery life of **24h**
- Easy and intuitive to use for parents and children
- **< 200g, < 170mm x 80mm x 40mm**

Challenges



There is a direct trade-off between processor throughput and power consumption, as well as radio usage and power. Higher efficiency boosts both life and utility.

Power vs. Performance

LoRa is designed for “long range” at the cost of low bandwidth. All messages must eventually be transmitted and neither case nor user should attenuate the antenna.



Bandwidth and Range

Challenges

The 68000 is a widely-used platform, but there's always a risk of undocumented behavior or software dependence on timing, caching, or other platform-specific behavior.



Platform Quirks

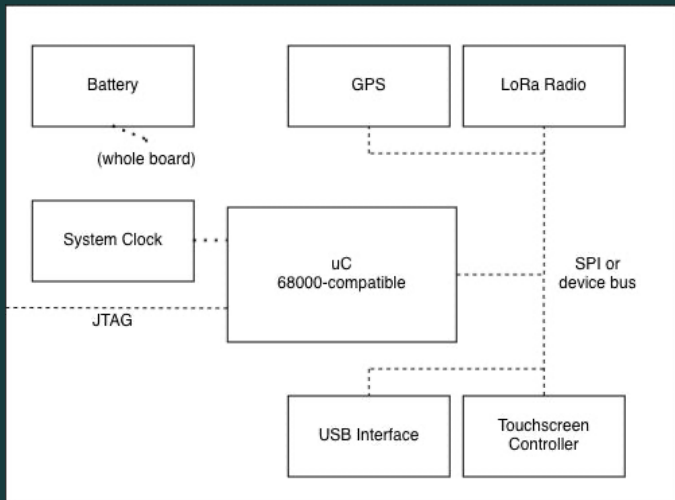


Integration

Assembling the final product into a small, portable device requires careful use of space and performance-aware placement of antennas and heat-generating components.

Approach (hardware)

Custom PCB for component integration

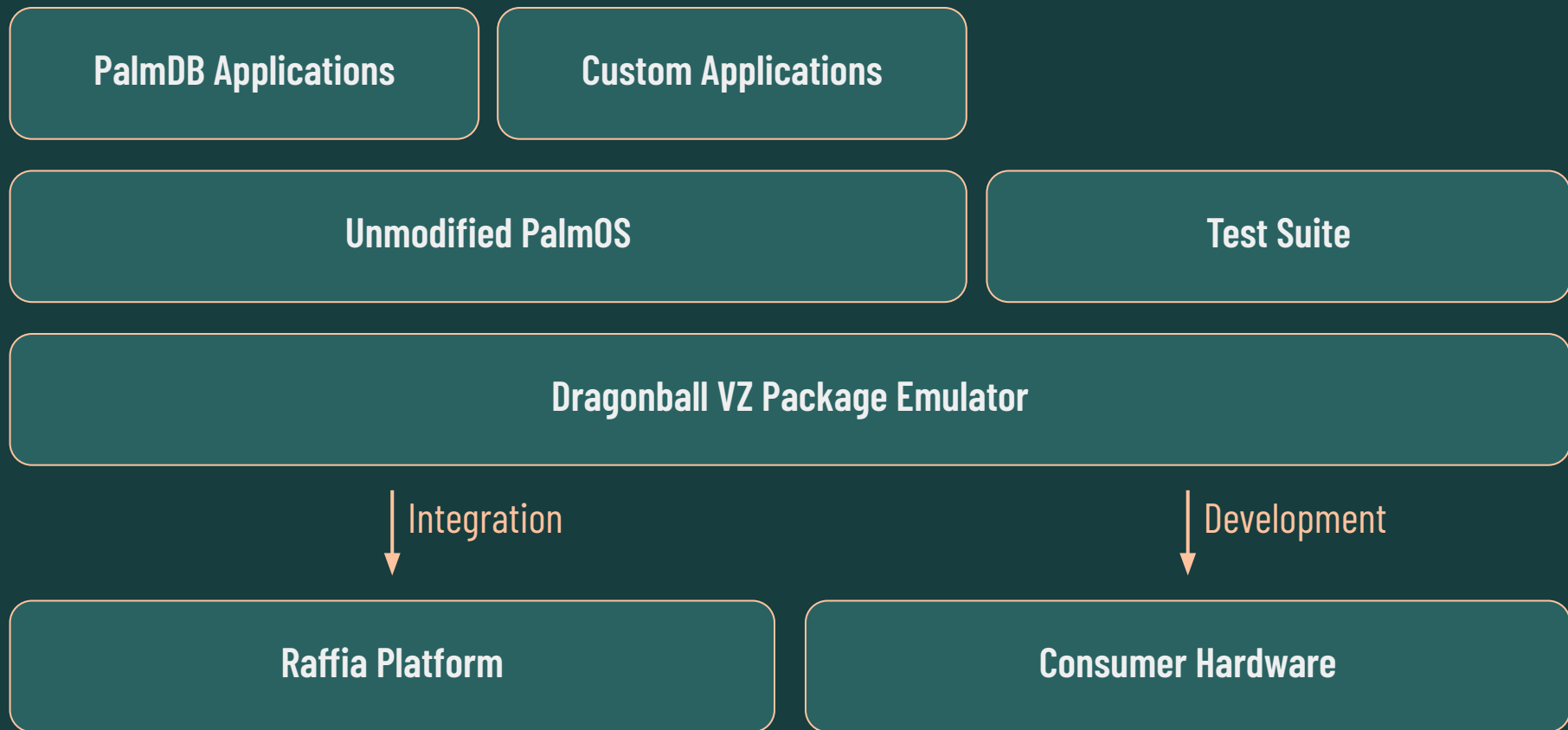


LoRa for P2P communication- no reliance on cellular

GPS modules for location tracking

MCU for emulating running software on
the early 68k processor

Approach (software)



Verification/Metrics

- LoRa device-to-device 90 percentile and 50 percentile ranges
- Idle and active battery life
- Run selected PalmOS Apps
- GPS error around campus (urban) and Schenley (rural)
- Qualitative user testing with children and adults
- Final package weight

Gantt Chart

[illegible]