

# Screen Implementation for Plan 9 on the Raspberry Pi4

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<a href="#">summary</a> <a href="#">Del</a> <a href="#">Snarf</a>   <a href="#">Look</a>	<a href="#">summary/abstract/abstract.txt</a> <a href="#">Del</a> <a href="#">Snarf</a>   <a href="#">Look</a>
<a href="#">abstract/</a> <a href="#">background/</a> <a href="#">problem/</a> <a href="#">goal/</a> <a href="#">research/</a> <a href="#">approaches/</a> <a href="#">references/</a>	<h1>ABSTRACT</h1> <p>Plan 9 is a unique operating system used primarily by researchers and hobbyists. In 2012, Richard Miller ported Plan 9 to the Raspberry Pi. This quickly became a popular platform for the lightweight operating system. The port is missing many hardware implementations. My research will first focus on building functionality for the Rasberry Pi 7 inch Touch Screen to open general communication across the DSI connectors. From there, I will explore how to best implement the unique mouse behavior with the touch screen.</p>
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# BACKGROUND

- Early 1980s: Plan 9 developed at Bell Labs  
An experimental operating system for research addressing UNIX issues  
Developed enough to be use as a standalone environment
- 2000: Released as open source
- 2012: Richard Miller writes his port for the Raspberry Pi
- 2015: Fourth edition released

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<a href="#">abstract/</a> <a href="#">background/</a> <a href="#">problem/</a> <a href="#">goal/</a> <a href="#">research/</a> <a href="#">approaches/</a> <a href="#">references/</a>	<h1>PROBLEM</h1> <p>The Raspberry Pi is a popular platform for Plan 9</p> <p>Missing many hardware implementations</p> <ul style="list-style-type: none"><li>- Audio Support</li><li>- DSI and CSI connectors</li><li>- GPIO Pins</li></ul> <p>No solutions currently</p> <ul style="list-style-type: none"><li>- Compatible with standard monitors</li><li>- Henri Tuhola wrote an SPI driver for a 7.8 inch e-paper display</li><li>- Compatible with the Compaq Ipaq on models H3630 and H3650 with 32MB of RAM</li></ul>
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abstract/ background/ problem/ goal/ research/ approaches/ references/	<h1>DEBATE</h1> <p>Plan 9 is unique and polarizing</p> <p>Mouse usage and design philosophies are highly debated</p> <p>No intent of joining the discussion, researching it, or forming a conclusion</p> <p>My Goals:</p> <ul style="list-style-type: none"><li>- Seamlessly extend Richard Miller's port</li><li>- Follow design patterns set forth by original authors</li><li>- Follow 9legacy model</li></ul>
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<a href="#">abstract/</a> <a href="#">background/</a> <a href="#">problem/</a> <a href="#">goal/</a> <a href="#">research/</a> <a href="#">approaches/</a> <a href="#">references/</a>	<h1>9LEGACY</h1> <p>Started as an alternative distribution of Plan 9 from Bell Labs</p> <p>Transitioned into a continuation of Plan 9 from Bell Labs</p> <p>Centralized Plan 9 patches</p> <p>Patches do not rely on each other and are updated as Plan 9 from Bell Labs updates</p> <p><i>“We strongly believe it is not a good idea to fork Plan 9 from Bell Labs. Too many communities is the enemy of the community. Plan 9 from Bell Labs is and will always be the reference distribution of Plan 9.”</i></p>
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# PLAN 9 ORIGINAL DESIGN

Considered “more-Unix-than-Unix”

Everything is a file

Compatibility is not a priority, keep some UNIX things, replace others. Design consistently for the programmer

Consistent appearance across set-ups

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9legacy.txt  
originaldesign.txt  
8andahalf.txt  
rio.txt  
acme.txt

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abstract/ background/ problem/ goal/ research/ approaches/ references/	<h1>8 1/2</h1> <h2>Original window manager for Plan 9</h2> <h3>Some core design principles</h3> <ul style="list-style-type: none"><li>- Three Button Mouse</li><li>- Overlapping Windows</li><li>- Built-in Terminal Program</li></ul>
summary/research/ Del Sna	<h2>UNIX has <code>/dev/tty</code> Plan 9 has <code>/dev/cons</code>, <code>/dev/mouse</code>, and <code>/dev/window</code></h2> <ul style="list-style-type: none"><li>- <code>/dev/tty</code> : Same file, different contents</li><li>- <code>/dev/cons</code> : Different file, same name, different contents</li></ul> <h2>Allows for mouse based creation of windows and mouse based text editing</h2>
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abstract/ background/ problem/ goal/ research/ approaches/ referances/	<h1>ACME</h1> <p>Interface built for the Plan 9 workflow</p> <p>Button 1 selects text</p> <p>Button 2 executes textual commands</p> <p>Button 3 combines context search and file opening functions</p> <p>All buttons can click, double click, and sweep text</p> <p>Windows are not clicked in to type in. Text is inserted in windows the cursor hovers over</p> <p>When new windows are created, the mouse is automatically moved</p> <p>Mouse buttons can be strung together as chords</p>
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# Multi-Touch

How to differentiate between button 1, 2, and 3?

How to differentiate between a click, sweep, hover, and chord?

Through forums, users have suggested:

- Relating to the MacOS port, use a trackpad like approach where ALT and CMD change to button 2 and 3 respectively
- Using the placement of multiple fingers to indicate buttons

Fingers too large and inaccurate for a 7 inch 800x480 screen

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stylus.txt  
Buttons.txt  
myapproach.txt

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# Stylus

Follow the Ipaq “bitsy” approach and use a stylus

Stylus allows for more precise taps than much larger fingers

Introduces new hardware - a compatible stylus with three buttons

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## Buttons

In a mailing list, user unobe talks about running a Plan 9 port on their PinePhone. They utilized the volume keys to toggle Button 2 and Button 3. They were able to perform basic key presses and some chording. They were not able to perform sweeps.

Requires less external hardware than the stylus

How to implement this to allow for sweeps?

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# My Approach

External buttons or a stylus appears to be the most feasible while still keeping with the Plan 9 original intentions

Multitouch is not a consideration

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<p>abstract/ background/ problem/ goal/ research/ approaches/ references/</p>	<h2>REFERENCES</h2> <p>Tom Duff, Rc - A Shell for Plan 9 and UNIX systems, Proc. of the Summer 1990 UKUUG Conf., London, July, 1990, pp. 21-33, reprinted, in a different form, in this volume.</p> <p>Rob Pike, The Text Editor sam, Software - Practice and Experience, Nov 1987, 17(11). pp. 813-845; reprinted in this volume.</p> <p>Rob Pike, 8½, the Plan 9 Window System, USENIX Summer Conf. Proc., Nashville, June, 1991, pp. 257-265, reprinted in this volume.</p> <p>Rob Pike, Acme: A User Interface for Programmers, USENIX Proc. of the Winter 1994 Conf., San Francisco, CA,</p> <p>Rob Pike, Window Systems Should Be Transparent, Murray Hill, New Jersey.</p> <p>Rob Pike, Rio: Design of a Concurrent Window System, Murray Hill, New Jersey.</p> <p>Rob Pike, The Good, the Bad, and the Ugly: The Unix Legacy, Copenhagen, 2001</p> <p>Corbet, J., Rubini, A., &amp; Kroah-Hartman, G. (2010). Linux device drivers. O'Reilly.</p> <p>Ron Minnich, Why Plan 9 Is Not Dead And What We Can Learn From It, Advanced Computing Lab Los Alamos National Lab LA-UR, 2004</p>
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