Genode OS on the PinePhone
FOSDEM 2023

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1. Background

2. Smartphones today

3. Genode on the Phone

4. Where we are, where we go
1. Background

2. Smartphones today

3. Genode on the Phone

4. Where we are, where we go
Background

- Self-funded company in Dresden / Germany
- Highly secure operating-system technology

Team

- Tight-knit group of 10 people
- Open-source community
- Genodians.org (https://genodians.org)

Business model

- Commercial licensing and support
- Contracted research and open-source development
Genode Operating System Framework

- Construction kit for special-purpose operating systems
- Designed for mixed criticality and dependability
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- Attack surface reduced by 99%
Genode Operating System Framework

- Construction kit for special-purpose operating systems
- Designed for mixed criticality and dependability
- **Attack surface reduced by 99%**
- Scales from embedded systems to general-purpose computing
- Integration of existing OSes (virtualization)
- Hundreds of ready-to-use components
Genode-based Sculpt OS

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4. Where we are, where we go
Dependency from smartphones is omnipresent.
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Smartphones need constant medication.
Curation of Apps, Security updates, Follow fashion
Dependency from smartphones is omnipresent.

Smartphones need constant medication.
Curation of Apps, Security updates, Follow fashion

Two corporations dominate.
Prospects

1. Participation in (digital) society
2. Enjoying the utility value of smartphones
3. Digital Autonomy
   - Dependability → no changes without user consent
   - Dignity → respect user attention, no Ads, no tracking
   - Privacy of communications
   - Protection of personal data
4. Sustainability
   - environmental footprint, learned skills
1. Participation in (digital) society

2. Enjoying the utility value of smartphones
1. Participation in (digital) society

2. Enjoying the utility value of smartphones

3. Digital Autonomy
1. Participation in (digital) society

2. Enjoying the utility value of smartphones

3. **Digital Autonomy**
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1. Participation in (digital) society

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3. **Digital Autonomy**
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   - Privacy of communications
   - Protection of personal data

4. Sustainability → *environmental footprint, learned skills*
Pinephone by Pine64

- Open-Source-friendly
  (*public documentation, schematics*)
- Targeting the Linux community
  (*mainline kernel, diverse distributions*)
- Well-understood 64-bit ARM SoC
- Readily available
  [https://www.pine64.org](https://www.pine64.org)
Open Source is not enough

Complexity defeats autonomy.

Linux distributions are impossible to assess.

We need to be faithful in an incomprehensible software stack.

No cure for security-update treadmill in sight.
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Component-based mobile OS
<table>
<thead>
<tr>
<th>Appliance role</th>
<th>Rich functionality</th>
</tr>
</thead>
</table>

- Clear relation to physical features
- Ultimate control
- Dependability
- Low complexity, low friction
- Fixed function, foster familiarity
- Expandable
- Rich user experience, great variety
- Updateable, customizable
- High complexity
- Provided by 3rd parties
- May not be trustworthy

Chasing a compromise between contradicting goals?
Mobile user interface

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Chasing a compromise between contradicting goals?
Mobile user interface - Split design
## Mobile user interface - Home screen

<table>
<thead>
<tr>
<th>Category</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Device</td>
<td>99% +</td>
</tr>
<tr>
<td>Phone</td>
<td>ready</td>
</tr>
<tr>
<td>Storage</td>
<td></td>
</tr>
<tr>
<td>Network</td>
<td>mobile</td>
</tr>
<tr>
<td>Software</td>
<td></td>
</tr>
</tbody>
</table>
## Mobile user interface - Phone section

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</tr>
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<tbody>
<tr>
<td>Phone</td>
<td>ready</td>
</tr>
<tr>
<td>Modem Power</td>
<td>Off</td>
</tr>
</tbody>
</table>

### Dial

| 1 | 2 | 3 |
| 4 | 5 | 6 |
| 7 | 8 | 9 |
| 0 | # |

### Call from

- **Accept**
- **Reject**

- **Storage**
- **Network** off
- **Software**
Mobile user interface

Live Demo
1. Background

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4. Where we are, where we go
Where we are, where we go

Eating our own dog food

Today

- Telephony
- Mobile data connectivity
- Package management, system update
- Device controls
  - battery, brightness, volume, mic
- Chromium-based Morph web browser
- Support for POSIX, OpenGL, Qt5
Eating our own dog food

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**Immediate steps**
- Completion of core phone functionality
- Performance, responsiveness
- Power efficiency, prolonged standby
- Encrypted storage, WireGuard VPN

**Later this year**
- GPS, Open-Street-Maps client
- Application SDK
First system image for the PinePhone

https://genodians.org
Thank you

Genode OS Framework
https://genode.org

Genodians.org community blog
https://genodians.org

Genode Labs GmbH
https://www.genode-labs.com