🌙 DARK MODE

Modes Architect re Implementation Roadmap

Design System Str c Planning • September 202 Dark Mode Edition

Date: September 11, 202 **tus:** Strategic Planning & Arc cture Design **Context:** Establishing comprehensive modes system architect with phased implementa trategy

Current State ysis

✅ Already Working es

- **Lightness modes:** `t/dark` themes fully implem d and functional
- **Interaction-empha odes:** `low/standard/high` hasis system operational
- **Viewport modes:** Responsive multiplier system (`mult sponsive: 4px desktop, 5px mobile`)

🔄 Partial Implementation Status

- **Component size modes:**

- `icon_holder` : ✅ Full size- `tag` ⚠️
- Other components: 🔍 Asses

🌙 Modes Architecture ap - Dark Mode | Design System Team | September 2025

🌙 DARK MODE

📋 Current Token Architecture Foundation

``

```
✅ Working Foundation:

semantic/
├── sizing.json # W3C DTCG compliant
├── spacing/desktop.json # Responsive multipliers
├── spacing/mobile.json # Responsive multipliers
├── color/s1-lightness/ # Light/dark themes
├── color/s2-emphasis/ # Emphasis modes
└── color/s3-semantic/ # Compiled semantic layer
global/themes-user/
├── lightness/ # Light/dark switching
└── viewport/ # Responsive system (4px/5px)
```

`

⚠️ Identified Gaps for VP

- `Missing: Unified` semantic/modes/ `architectu`
- `Missing:` component-size `theme configuratio`
- `Missing: Basic` viewport `mode simplification` `sktop/mobile only)`

🌙 DARK MODE

� Strategic Objectives

Primary Goal: Establish comprehensive modes archit ure foundation with Phase 1 MVP implementation:

- **Big picture architecture** - Complete future vis with 11-dimensional modes system
- **Strategic roadmap** - Phased implementation stra y for systematic expansion
- **Architecture foundation** - Extensible framewor r all future mode types
- **Phase 1 VP modes** - Essential foundation modes r immediate implementation

�🏗️ Complete Future Architectu Vision

📋 **Full odes Architecture Roadmap** *(All structure repared, selective implementation)*

Phase 1: VP Foundation odes *(Prim Implementation Focus)*

- **Lightness modes -** light/dark ✅ (existing th ightness switching)
- **Interaction-emphasis modes -** low/standard/high (existing component interaction states)
- **Component Size modes -** sm/md/lg 🔄 (WIP mig on - component dimension coordination)
- **Viewport modes (basic) -** desktop/mobile 🆕 (plified device distinction for MVP)

🌙 Modes Architecture Roadmap - Dark Mode | Design System Team | September 2025

Phase 2: Advanced System odes *(Architecture Ready, Implementation Deferred)*

🌙 DARK MODE

Complete ulti-Dimensional Architect

`

```
Full Future System (All 11 Mode Types):

lightness × interaction-emphasis × viewport × comp nt-size × density × contrast × motion × typography × user-font-
× user-motion-pref × user-contrast-pref × dyslexic pport

= 11-dimensional mode combinations
```

`

🚀 VP Implementation Scope

🎯 **VP Goal:** Prove modes architecture with essent foundation + targeted testing

---

VP odes Selection *(Phase 1 Essent Implementation)*

- ✅ **Lightness modes:** light/dark (existing ther ghtness switching)
- ✅ **Interaction-emphasis modes:** low/standard/h (existing component interaction states)
- 🔄 **Component Size modes:** sm/md/lg (WIP migr n - component dimension coordination)
- 🆕 **Viewport modes:** desktop/mobile (basic 2- kpoint system for MVP)

VP Architecture: lightness × interaction-emphasis × ponent-size × viewport (4D system)
Note: Density modes moved to Phase 2 - focus on s mode migration completion first

🌙 DARK MODE

VP Component Testing Suite *(Strate Component Selection)*

🧪 Test Case 1: Simple Component - icon_holder

- **Purpose**: Baseline size mode behavior validati
- **odes tested**: All size modes (sm/md/lg)
- **Complexity**: Low (single dimension changes)

🧪 Test Case 2: Interactive Component - button

- **Purpose**: Interactive states + size mode coord ion
- **odes tested**: All size modes + interaction-emp s modes + lightness modes
- **Complexity**: Medium (multiple mode interaction

🧪 Test Case 3: Content Component - tag

- **Purpose**: Text content + size mode relationshi

- **Complexity**: Medium (content-responsive sizing iewport coordination)

🌙 DARK MODE

🧪 Test Case 4: Status Component - infobox

- **Purpose**: Semantic color modes + worst-case st scenarios
- **odes tested**: All interaction-emphasis modes - ghtness modes (all status colors)
- **Complexity**: High (color mode combinations + st s semantics)

🧪 Test Case 5: Composite Component - input text

- **Purpose**: Babuschka doll complexity (input + t remove button inside)
- **odes tested**: All Phase 1 modes combined (lig ss × interaction-emphasis × component-size × viewport)
- **Complexity**: Very High (nested component mode ritance + worst-case scenario)

VP Token Foundation *(Complete Arch cture, Selective Population)*

`

```
semantic/
├── modes/ # 🆕 COMPLETE ARCHITECTURE PREPARED
| ├── component-size/ # ✅ MVP: Full implementati m/md/lg)
| | ├── sm.json
```

🌙 DARK MODE

```
| | └── lg.json
| ├── density/ # 🔄 STRUCTURE READY: Implementati eferred from MVP
| | ├── compact.json # (architecture prepared, tok placeholder)
| | ├── comfortable.json
| | └── spacious.json
| └── _future-modes/ # 🏗️ COMPLETE STRUCTURE PREP
| ├── responsive/ # (folder structure + placeholde iles)
| ├── contrast/
| ├── motion/
| ├── typography/
| └── user-preferences/
```

```
global/themes-user/
├── lightness/ # ✅ MVP: Existing (light/dark)
├── interaction-emphasis/ # ✅ MVP: Existing (s2-e sis modes: low/standard/high)
├── viewport/ # ✅ MVP: Simplified (desktop/mobil y)
├── component-size/ # ✅ MVP: Full implementation
| ├── sm.json
| ├── md.json
| └── lg.json
```

```
└── _future-modes/ # 🏗️ COMPLETE STRUCTURE: All fo rs + placeholder files
```
`

🌙 DAR DE

🎯 Implementation Phases:

- Phase 1 (VP): 4 essential modes - lightne interaction-emphasis × viewport × component-size
- Phase 2: Add advanced system modes - + de × contrast × motion + full viewport coverage
- Phase 3: Add user preference & accessibili odes - + typography × user-font-scale × user-motion-pref × user-contrast-pref × dyslexia-support

Complete architecture prepared from start, sel ve activation by phase

✅ Already Implemented - Icon Holder Co nent

Location: src/lib/themes/component/atom/icon_hold `

```
├── sm.json # Small variant

├── md.json # Medium variant

├── lg.json # Large variant

└── static.json # Context-independent
```

`

Current Structure:

```
` json
{
```

DARK MODE

```
"c": {

"icon_holder": {

"size": {

"standard": { "$value": "{ob.p.size.250}" },

"mini": { "$value": "{ob.p.size.175}" }

}

}

}

}

}
`
```

✅ Partially Implemented - Tag Componen

Location: src/lib/themes/component/molecule/tag.jsc
Current Pattern - Size-aware tokens within sing ile:

```
` json
{

"padding": {

"vertical": {

"sm": { "$value": "{ob.s.spacing.none}" },

"md": { "$value": "{ob.s.spacing.xs}" },
```

DARK MODE

```
},
"horizontal": {
"sm": { "$value": "{ob.s.spacing.md}" },
"md": { "$value": "{ob.s.spacing.lg}" },
"lg": { "$value": "{ob.s.spacing.2xl}" }
}
}
}
`
```

Current Token Architecture

Existing Semantic Structure:

```
`
semantic/
├── sizing.json # ✅ W3C DTCG compliant dimensi okens
├── spacing/
| ├── desktop.json # ✅ Responsive spacing with tipliers
| └── mobile.json # ✅ Responsive spacing with ipliers
├── color/
| ├── s1-lightness/ # ✅ Theme mode implementat
| ├── s2-emphasis/ # ✅ Emphasis mode implement n
```

🌙 DARK MODE

```
| └── s3-semantic/ # ✅ Compiled semantic layer
└── [other categories]
`
```

Global Theme System:

```
`
global/themes-user/
├── lightness/ # ✅ Light/dark theme switching
| ├── dark.json
| └── light.json
└── viewport/ # ✅ Responsive multiplier system
├── desktop.json # mult_responsive: 4
├── mobile.json # mult_responsive: 5
└── static.json
`
```

odes Architecture Implement ion Strategy

Phase 1: Establish Universal odes A itecture Foundation

Create semantic/modes/ Architecture Fra ork

```
`
semantic/
```

🌙 Modes Architecture Roadmap - Dark Mode | Design System Team | September 2025

🌙 DARK MODE

```
| ├── component-size/ # 🆕 Component dimension es
| | ├── sm.json # Small size mode tokens
| | ├── md.json # Medium size mode tokens (base e)
| | └── lg.json # Large size mode tokens
| ├── density/ # 🆕 Spacing density modes
| | ├── compact.json # Tighter spacing multipli
| | ├── comfortable.json # Standard spacing (ba ne)
| | └── spacious.json # Looser spacing multipli
| ├── _future-modes/ ~~# 🆕 Reserved~~ space for mo requiring research
| | ├── responsive/ ~~# Phase~~ 2: Viewport-based s ng (framework enabled, implementation deferred)
| | ├── contrast/ ~~# Phase~~ 2: A11y high contrast es (research required)
| | ├── motion/ # Phase ~~2: Animation~~ preference nabled/disabled/reduced)
| | ├── typography/ # Phase ~~2: Font~~ scaling, re g modes (research required)
| | └── user-preferences/ # Phase 3: User-contr d A11y modes (font scaling, motion, contrast, dyslexia support)
| └── README.md # 🆕 Modes architecture system mentation
`
```

Key odes Architecture Principles:

- **Scalable**: Easy to add new mode categories
- **Consistent**: All modes follow the same toker ucture patterns
- **Semantic**: Mode tokens reference primitive/s tic tokens, not hardcoded values
- **Extensible**: Architecture supports future A1 UX, and brand mode requirements

🌙 Modes Architecture Roadm ap - Dark Mode | Design System Team | September 2025

Phase 2: Semantic ode Token Definitions

Component Size odes (semantic/modes/component-size/)

sm.json - Small component dimensions: ` json

```
{

"ob": {

"s": {

"modes": {

"component-size": {

"button": {

"height": { "$type": "dimension", "$value": "{ob.s.size.element.sm}" },

"min-height": { "$type": "dimension", "$value": "{ob.s.size.element.sm}" }

},

"input": {

"height": { "$type": "dimension", "$value": "{ob.s.size.element.sm}" }

},

"tag": {

"padding-vertical": { "$type": "spacing", "$value": "{ob.s.spacing.none}"
```

DA[illegible]DE

```
}

}

}
```

` md.json - Medium component dimensions (base[illegible]): ` json

```
{

"ob": {

"s": {

"modes": {

"component-size": {

"button": {

"height": { "$type": "dimension", "$value": "{o[illegible]size.element.md}" },

"min-height": { "$type": "dimension", "$value": [illegible]b.s.size.element.md}" }

},

"input": {

"height": { "$type": "dimension", "$value": "{o[illegible]size.element.md}" }

},

"tag": {

"padding-vertical": { "$type": "spacing", "$val[illegible] "{ob.s.spacing.xs}" },

"padding-horizontal": { "$type": "spacing", "$v[illegible]": "{ob.s.spacing.lg}" }

}
```

Modes Architecture [illegible]ap - Dark Mode | Design System Team | September 2025

🌙 DARK MODE

```
}

}

}

}
`
```

Density odes (semantic/modes/density/)

comfortable.json - Standard density (baseline): json

```
{

"ob": {

"s": {

"modes": {

"density": {

"layout": {

"stack-gap": { "$type": "spacing", "$value": "{ .spacing.lg}" },

"card-padding": { "$type": "spacing", "$value": b.s.spacing.xl}" },

"section-margin": { "$type": "spacing", "$value {ob.s.spacing.2xl}" }

}

}

}

}
```

🌙 Modes Architecture Roa ap - Dark Mode | Design System Team | September 2025

🌙 DARK MODE

}
` compact.json - Tighter density: ` json

```json
{
"ob": {
"s": {
"modes": {
"density": {
"layout": {
"stack-gap": { "$type": "spacing", "$value": "{ .spacing.md}" },
"card-padding": { "$type": "spacing", "$value": b.s.spacing.lg}" },
"section-margin": { "$type": "spacing", "$value {ob.s.spacing.xl}" }
}
}
}
}
}
}
```

Phase 3: Universal odes Architectur heme Integration

Add to global/themes-user/ - Comprehens odes Support

🌙 DARK MODE

```
global/themes-user/
├── lightness/ # ✅ Existing: Light/dark theme     es
├── viewport/ # ✅ Existing: Responsive scaling     des
├── component-size/ # 🆕 NEW: Size modes config     tion (design system controlled)
|  ├── sm.json # References semantic/modes/compo     -size/sm.json
|  ├── md.json # References semantic/modes/compo     -size/md.json (default)
|  └── lg.json # References semantic/modes/compo     -size/lg.json
├── density/ # 🆕 NEW: Density modes configurat     (product designer controlled)
|  ├── compact.json # References semantic/modes/     ity/compact.json
|  ├── comfortable.json # References semantic/mo     /density/comfortable.json (default)
|  └── spacious.json # References semantic/modes     sity/spacious.json
└── _future-modes/ ~~# 🆕~~ RESERVED: Modes archite     e ready for expansion (Phase 2+)
├── responsive/ ~~# Phase~~ 2: Viewport-based scali     odes (framework ready, research needed)
├── contrast/ ~~# Phase~~ 2: A11y high contrast mod     research required)
├── motion/ # Phase ~~2: A~~nimation preference mod     enabled/disabled/reduced)
├── typography/ # Phase 2: ~~Typography~~ scaling m     (research required)
└── user-preferences/ # Phase 3: User-contr     d A11y modes (font scaling, motion prefs, contrast, dyslex
support)
```

🌙 Modes Architecture R   ap - Dark Mode | Design System Team | September 2025

ulti-Dimensional odes Architecture:

🌙 DARK MODE

- Phase 1: lightness × viewport × component-siz density (4D) - Full implementation
- Phase 2: + responsive × contrast × motion × ty aphy (8D) - Framework enabled, research required
- Phase 3: + user-preferences (9D+) - User-c rolled A11y modes (font scaling, motion, contrast, dyslexia support)
- Future: Additional modes as requirements e ge (nD)

Phase 4: Component igration

Strategy A: Keep Current Icon Holder Pa rn ✅ Recommended

Rationale: Already working, follows semantic bo ries
Current icon_holder structure → Continue using rate files

- sm.json , md.json , lg.json reference se ic modes
- Maintains component isolation
- Allows component-specific size boundaries

Strategy B: igrate Tag to Semantic Ref nces

🌙 DARK MODE

```
` json
{
"padding": {
"vertical": {
"sm": { "$value": "{ob.s.spacing.none}" },
"md": { "$value": "{ob.s.spacing.xs}" },
"lg": { "$value": "{ob.s.spacing.lg}" }
}
}
}
`
```

After (semantic reference):

```
` json
{
"padding": {
"vertical": {
"sm": { "$value": "{ob.s.modes.component-size.t[illegible]adding-vertical}" },
"md": { "$value": "{ob.s.modes.component-size.t[illegible]adding-vertical}" },
"lg": { "$value": "{ob.s.modes.component-size.t[illegible]adding-vertical}" }
}
}
}
`
```

🌙 DAR ODE

Implementation Recommendatio

✅ Preserve What Works

- Keep icon_holder file-based structure - Alr y follows semantic boundaries
- Keep responsive multiplier system - mult_ onsive in viewport themes works well
- Keep existing semantic/sizing.json - W3C D compliant and properly structured

🔄 igrate Gradually

Pre- igration: System Cleanup ⚠️

1. Create dedicated migration branch - Work on ture/size-modes-migration to isolate changes from current development 2. Create new Figma file for migrat branch - Duplicate current design system file and associate wit the migration branch for design-dev sync 3. Rep all broken token references - Fix any invalid {ob.*} token references before introducing new semantic mode Validate existing token chains - Ensure current semantic toker properly resolve to primitive values 5. Test cu t build process - Confirm all existing components compile successfully

Priority 1: Create Universal odes Arch cture Foundation

🌙 Modes Architecture R ap - Dark Mode | Design System Team | September 2025

🌙 DARK MODE

1. Create semantic/modes/ folder structure wi xtensible modes architecture
2. Define component-size modes tokens (sm/md/lg
3. Define density modes tokens (compact/comfort e/spacious)
4. Reserve _future-modes/ structure for planne rchitecture expansions

Priority 2: Component Integration with es Architecture

1. Tag component → Reference semantic modes arc ecture
2. Add component boundaries (sm/md/lg limits pe omponent)
3. Validate grid alignment with multiplier syst

Priority 3: Establish ulti-Dimensional des Architecture System

1. Add component-size and density modes configu on (controlled by design system consumers/product designers)
2. Test multi-dimensional modes combinations (l ness × viewport × component-size × density)
3. Document modes interaction patterns and arch ture extensibility
4. Validate scalability for future modes additi requiring research (responsive, contrast, motion, typography)

Note: Density modes are design system configura s set by product designers, not user preferences.

⚠️ Key Considerations

Grid Alignment Validation

- Ensure mult_responsive (4px desktop, 5px le) preserves 4px grid

🌙 Modes Architecture R ap - Dark Mode | Design System Team | September 2025

- `Validate that semantic mode tokens respect base grid`

Component Boundaries

Based on competitive analysis findings, most design systems (75%) use independent component sizing:

`combinations.`

Implementation Checklist

Phase 1: Universal odes Architecture Foundation

🌙 DA[illegible]DE

Phase 3: Component igration & odes [illegible]chitecture Validation

- [ ] Migrate tag component to semantic modes [illegible]chitecture references
- [ ] Validate icon_holder compatibility with [illegible]w modes architecture
- [ ] Test grid alignment across all current [illegible]es combinations
- [ ] Document component integration patterns [illegible]r future modes

Phase 4: odes Architecture Validati[illegible] & Future-Proofing

- [ ] Verify multiplier system maintains 4px [illegible]d alignment
- [ ] Test all current modes combinations fu[illegible]on correctly
- [ ] Validate component boundaries prevent b[illegible]king points
- [ ] Document extensible patterns for future[illegible]des architecture categories
- [ ] **Phase 2 Planning**: Research responsive m[illegible]s, A11y high contrast, animation preferences, and typography scaling
- [ ] **Phase 3 Planning**: Research user prefere[illegible] modes (font scaling A+/A/A−, motion preferences, contrast settings, dyslexia-friendly typography)
- [ ] **Long-term Planning**: Define implementati[illegible]roadmap for user-controlled accessibility modes

Expected Benefits

For Designers

- Comprehensive mode system for component siz[illegible]ordination *(Note: Based on research, only 25% of design syste[illegible] implement size coordination)*

- Component size mode options (sm/md/lg) at t design system level

🌙 DARK MODE

For Developers

- **Universal modes architecture** that scales be d size and density
- Clear modes system patterns following W3C D standards
- **Future-proof architecture foundation** for ac sibility and UX modes requirements

For System

- **Scalable tokens architecture** aligned with W DTCG standards
- Maintains existing responsive multiplier be ts
- Preserves 4px grid alignment system
- **Extensible modes architecture foundation** re for planned mode categories (contrast, motion, typography)
- **ulti-dimensional modes theme system** suppor g complex product requirements

🎯 VP Success Criteria

Architecture Validation

- [ ] Complete modes architecture structure p red for all future phases

🌙 Modes Architecture R ap - Dark Mode | Design System Team | September 2025

- [ ] Token resolution validates across all mode combinations
- [ ] Theme switching works seamlessly betwe all MVP modes

🌙 DARK MODE

Component Validation

- [ ] All 5 test components render correctly all MVP mode combinations
- [ ] infobox shows all status colors work oss lightness + interaction-emphasis modes
- [ ] input text field babuschka complexity ha es nested component modes correctly
- [ ] Size mode coordination works across i holder , button , tag` relationships

Technical Validation

- [ ] Simplified viewport (desktop/mobile) maintains 4 rid alignment
- [ ] Build system processes all mode combinations w ut errors
- [ ] No broken token references across any MVP mo ombination
- [ ] Documentation clearly shows MVP scope vs futu rchitecture vision

🌙 Modes Architecture Roadmap - Dark Mode | Design System Team | September 2025

🔄 Post-MVP Expansion Path

🌙 DARK MODE

Phase 2: Add density modes to existing 4D system → 5D stem **Phase 3**: Enable responsive, contrast, motion, typography
Phase 4: User preference modes → 12D system (comple

Complete architecture prepared from MVP, selective ac tion by phase

🌙 Modes Architecture ap - Dark Mode | Design System Team | September 2025