**TPAC 2020** 

## Web Support for New Device Features

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intel

## New form factors available today











## Foldable Display Laptop: Intel Horseshoe Bend

17.3"Foldable OLED display Posture based user experience Speaker and camera switching

Hero mode: Table top Primary use mode: Laptop



Embedded video of Intel's Horseshoe Bend concept platform removed to significantly reduce file size

## Lenovo's X1 Fold [with Intel Processor Graphics]







https://www.lenovo.com/us/en/thinkpad-x1-fold

What is changing from past MID platforms?

- Adaptability
- Posture-based
- Resource configuration
- Multiple usage scenarios
- Challenge: consistency
- Posture determination
- Posture enforcement
- Single foldable Vs multiple internal



ASUS Taichi: front and back display laptop



ASUS Zenbook Pro Duo: two asymmetric panels

## Key differences between these devices





- Two internal screens (could be more in the future)
- Physical hinge that separates content
- Sharper fold
- 360 degrees hinge

- Single internal foldable OLED screen
- No physical hinge
- Less acute fold
- As this time 180 degrees hinge

## Multiple Internal Vs Foldable

	Multiple Internal	Foldables
# of Displays	2 (maybe more)	1
Visibility to OS	1 or 2 Display (OS dependent)	1 Display <sup>1</sup>
Visibility to apps	>=1 [Depends on display configuration]	
Seam	Physical	Virtual <sup>2</sup>
Touch Controller	Two independent	One
1. Could be > 1 virtual displays	5	inte

## Platform Design and Postures



• Software layers do not prevent any of these

postures in either MID or foldable platforms

• Panel technology considerations make some

easier on MID

- Acute folds
- Some others map more naturally on foldable

since there is no seam

• Single frame buffer

## Seam Impacts Content Structuring



#### Unenlightened App content

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#### Existing apps "just work"

(No loss of information or interactivity)









#### Presence of seam in MID => restructuring content helps with UX

(App author chose not to enlighten for this posture)

## Video Example

Lack of seam

works for

posture in

tabletop

foldable

#### Unenlightened App content



#TheMandalorian The Mandalorian - Official Trailer 2 | Disney+ | Streaming Nov. 🗸 12



#### Existing apps "just work" (No loss of information or interactivity)



#TheMandalorian #DisneyPlus The Mandalorian - Official Trailer '2 | Disney+ | Streaming Nov. v 12



Presence of seam in MID => restructuring content helps with UX

Enlightened apps "work even better"



#TheMandalorian #DisneyPlus The Mandalorian - Official Traile 2 | Disney+ | Streaming Nov. 🐱 12







## MID Vs Foldable: Enablement needed



	Multiple Internal	Foldable
Tablet	Content in 1 display	½ display. Posture- based reduction in Frame Buffer
Laptop	Enlightened app/Rotated	Unenlightened app if no virtual hinge
Book	Enlightened	Unenlightened app if no virtual hinge
Table Top	Enlightened	Unenlightened
Tent	Enlightened app/Rotated	Posture aware / Rotated
"Half" Portrait (KBD occlusion)	Content in 1 display	<sup>1</sup> ⁄2 display. Posture and occlusion aware

Beyond #displays, apps could benefit from information on platform type (MID Vs Foldable), posture, orientation, hinge, occlusion

## Enable new UX patterns



## UX Opportunities (Multiple Internal)





## Current spec coverage

	Multiple Internal	Foldable
Postures		Screen Fold API
Physical Hinge/Seam	Window Segment/CSS Spanning	
Segment Geometries	Window Segment/CSS Spanning	
Fold angle		Screen Fold API

- APIs seem to be complementary if implemented in both variants of devices.
- Are we sending confusing message to developers by splitting into two APIs?

## Summary & Next Steps

- MID is not the same as a foldable display
- Foldable display without a virtual hinge is like single display in some postures
- Foldable display with virtual hinge simulates MID [2 virtual displays]
- Dual Screen definition needs to have the ability to handle both MID and foldable display platforms

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