Agenda

- Introduction
- Touch in mobile devices 2” – 17”
- Touch in stationary enterprise applications 10” – 30”
- Touch in stationary consumer applications 15” – 30”
- Touch in large-format >30”
- Conclusions
About NextWindow

- **NextWindow**
  - Develops & manufactures optical touchscreens
  - Currently focused on two touch-screen markets
    - Windows-7 consumer monitors and all-in-one computers
    - Large-format display applications such as interactive digital signage
  - Global presence
    - New Zealand (HQ), Singapore (Ops), USA, Taiwan, Korea, Japan
    - Manufacturing in China, Thailand and Malaysia
    - 120 employees, 55 in engineering
  - Brief history
    - 2000: Founded by CTO and private investors
    - 2003: First product to market (optical touch for large displays)
    - 2005: Entered USA market
    - 2006: First major volume contract signed (HP TouchSmart AiO)
    - 2008: Entered Taiwan market with ODM focus
    - 2009: Engaged with many PC OEMs & ODMs on Win-7 products
    - 2010: Acquired by SMART Technologies
Is Touch Really Just About Mobile Phones?

Is this all there is?

Is touch really all about 200M mobile phones and everything else is more or less irrelevant?
No! Touch Is Spreading Everywhere

- Touch was everywhere at the 2010 CES show (USA)
  - There seemed to be a built-in assumption that all consumer devices should be touch-enabled
Mobile Devices 2” – 17”

- **Touch technology choices for mobile**
  - Analog resistive
  - Projected capacitive (p-cap)
  - Analog multi-touch resistive (maybe)

- **NextWindow believes that P-cap is going to win the race**
  - DisplaySearch (market research firm) is forecasting that p-cap revenue will exceed analog resistive revenue this year
    - DisplaySearch says p-cap revenue in 2009 was $1.3B
  - Most mobile device makers are experimenting with p-cap
    - Apple iPad continues the trend started with the iPhone
Even AM-OLED Phones Are Going to P-Cap!

- **Samsung S8500 Wave mobile phone with Super OLED uses on-cell p-cap touch (Feb. 2010)**
  - 3.3-inch 800x480 (283 ppi) AMOLED
  - “Super OLED” is Samsung’s strange branding for on-cell touch

Source: Samsung booth graphic at Mobile World Congress 2010
Why P-Cap?

- **Multi-touch**
  - Apple made it a requirement

- **Durability**
  - Glass top surface

- **Optical performance**
  - Only 3% light loss

- **Light touch**
  - Zero pressure

- **Flush top surface**
  - Zero bezel

- **Stylus**
  - Cypress has announced 1 mm stylus for p-cap!
The War Is Over In Mobile

P-Cap Has Won!
Question #1

Do you agree that p-cap is the future of mobile touch?
What About Stationary Devices?

- For stationary devices 10” – 30” in enterprise applications
  - NextWindow believes that multiple touch technologies will continue to dominate for a combination of application, technical and business reasons
    - ✓ Kiosks = SAW or surface capacitive
    - ✓ Casino gambling = Surface capacitive
    - ✓ Point of sales (POS) = 5-wire resistive or infrared
    - ✓ Industrial control = 5-wire resistive
    - ✓ Outdoor device control = projected capacitive
    - ✓ Etc.

(There is no perfect touch technology!)
NextWindow believes that optical touch will remain dominant in stationary consumer applications 15” – 30”

What, you didn’t know that optical is already dominant?

It’s in 95% of consumer All-in-One (AiO) touch computers and touch monitors, and those are the only products that are touch-enabled for stationary consumer applications >15”
Examples

HP

Medion

NEC

Sony

Dell

Lenovo
13 Touch Technologies

1 – Analog Resistive
2 – Analog Multi-Touch Resistive (AMR)
3 – Surface Acoustic Wave (SAW)
4 – Traditional Infrared (IR)
5 – Waveguide Infrared (from RPO)
6 – Surface Capacitive
7 – Projected Capacitive (P-Cap, including on-cell)
8 – Optical
9 – Acoustic Pulse Recognition (APR from Elo)
10 – Dispersive Signal Touch (DST from 3M)
11 – Embedded (in-cell optical/voltage/charge-sensing)
12 – Vision-Based (like Microsoft Surface)
13 – Force Sensing (no current supplier)
Touch Technology Requirements for Windows-7 AiOs & Monitors...1

- **Multi-touch (Windows-7 logo)**
  - Analog Resistive, Surface Capacitive, Acoustic Pulse Recognition (APR from Elo), Dispersive Signal Technology (DST from 3M) & Force-Sensing
    - ✓ **Disqualified:** No multi-touch

- **Size range 15” – 30”**
  - Waveguide IR (from RPO)
    - ✓ **Disqualified:** Too small
  - DST
    - ✓ **Disqualified:** Too big

- **Touch-and-hold**
  - APR & DST
    - ✓ **Disqualified:** No touch-and-hold
Touch Technology Requirements for Windows-7 AiOs & Monitors

- **Low profile**
  - Vision-Based
    - **Disqualified:** Too thick (projection only)

- **Shipping in high volume (> 500K)**
  - Waveguide Infrared, Force-Sensing
    - **Disqualified:** Not in volume production
  - Embedded touch
    - **Disqualified:** Embedded in >15” AiOs & monitors is unlikely to be shipping in high volume even 3 years from now
What’s Left?

- Optical
- Projected Capacitive (P-Cap, including on-cell)
- Analog Multi-Touch Resistive (AMR)
- Surface Acoustic Wave (SAW)
- Traditional Infrared (IR)
Why Optical?

- **Lowest cost multi-touch**
  - Multi-touch is a definite requirement
- **Most scalable**
  - Increase size just by increasing retro-reflector length
- **Touch with any object**
  - Unlike p-cap’s finger-only touch
  - Object size recognition
- **High durability**
  - Plain glass touch surface
- **High optical performance**
  - No coatings to wear out or scratch
- **And more…**
# Desktop Touch Technology Comparison

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Optical</th>
<th>P-Cap</th>
<th>SAW</th>
<th>AMR</th>
<th>IR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size range 17” – 25”</td>
<td>H</td>
<td>M</td>
<td>H</td>
<td>M</td>
<td>H</td>
</tr>
<tr>
<td>Touch with any object</td>
<td>H</td>
<td>L</td>
<td>L</td>
<td>M</td>
<td>H</td>
</tr>
<tr>
<td>Light touch</td>
<td>H</td>
<td>H</td>
<td>L</td>
<td>M</td>
<td>H</td>
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<tr>
<td>Multi-touch</td>
<td>M</td>
<td>H</td>
<td>M</td>
<td>H</td>
<td>M</td>
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<tr>
<td>Object size recognition</td>
<td>H</td>
<td>H</td>
<td>L</td>
<td>M</td>
<td>L</td>
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<tr>
<td>Fast response and drag</td>
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<td>H</td>
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<td>H</td>
<td>M</td>
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<tr>
<td>Low profile (flush surface)</td>
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<td>H</td>
<td>M</td>
<td>H</td>
<td>L</td>
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<tr>
<td>High durability</td>
<td>H</td>
<td>H</td>
<td>H</td>
<td>L</td>
<td>H</td>
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<tr>
<td>High optical performance</td>
<td>H</td>
<td>M</td>
<td>H</td>
<td>L</td>
<td>H</td>
</tr>
<tr>
<td>Narrow border width</td>
<td>H</td>
<td>H</td>
<td>L</td>
<td>M</td>
<td>L</td>
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<tr>
<td>Insensitive to EMI &amp; RFI</td>
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<td>L</td>
<td>H</td>
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<td>Easy integration</td>
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<td>Low cost</td>
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<td>L</td>
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<td>H</td>
<td>L</td>
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<tr>
<td>Shipping in high volume</td>
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<td>H</td>
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<td>Simple sensor manufacturing</td>
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<td>M</td>
<td>L</td>
<td>M</td>
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<tr>
<td>High MTBF</td>
<td>H</td>
<td>H</td>
<td>M</td>
<td>H</td>
<td>L</td>
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<td>Multiple sources</td>
<td>H</td>
<td>H</td>
<td>L</td>
<td>M</td>
<td>H</td>
</tr>
</tbody>
</table>

**H** = High (Best)  **M** = Medium (OK)  **L** = Low (Worst)
Question #2

Do you agree that optical is the future of 15” – 30” stationary consumer touch?
How Optical Touch Works

Diagram showing the components and flow of optical touch, including:
- Controller Electronics
- Optical Sensors
- Infrared LEDs
- Emitted & Reflected IR Light
- Retroreflectors
- Glass Substrate

Graph showing light intensity vs. optical sensor pixel position with a note indicating the LED reflecting directly into the optical sensor at a specific touch point.
What About Large-Format (>30’’)?

- **>30 inches**
  - Analog Resistive, Analog Multi-Touch Resistive, Surface Capacitive, Waveguide IR (from RPO), Embedded
    - **Disqualified:** Too small

- **Low profile**
  - Vision-Based
    - **Disqualified:** Too thick (projection only)

- **Likely to be available in 3 years**
  - Force-Sensing
    - **Disqualified:** No current supplier; three failures so far
What’s Left?

- Optical
- Traditional Infrared (IR)
- Projected Capacitive (P-Cap, with wires on film)
- Surface Acoustic Wave (SAW)
- Acoustic Pulse Recognition (APR from Elo)
- Dispersive Signal Technology (DST from 3M)
Why Optical?

- **Scalable to >100 inches**
  - No added components in larger sizes, unlike infrared
- **Lowest cost**
  - Most economical large-format touch-screen solution
- **Multiple suppliers**
  - Unlike single-source APR & DST
- **High optical performance**
  - No visible wires like in projected capacitive film
  - Uses common soda-lime glass, unlike SAW’s boro-silicate
- **Touch with any object**
  - Unlike soft touch-object required by SAW
- **And more…**
# Large-Format Touch Technology Comparison

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Optical</th>
<th>IR</th>
<th>P-Cap (Film)</th>
<th>SAW</th>
<th>APR</th>
<th>DST</th>
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<tr>
<td>Touch with any object</td>
<td>H</td>
<td>H</td>
<td>L</td>
<td>M</td>
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<td>L</td>
<td>M</td>
<td>H</td>
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<tr>
<td>Light touch</td>
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<td>H</td>
<td>H</td>
<td>L</td>
<td>M</td>
<td>H</td>
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<tr>
<td>No unintended touch</td>
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<td>L</td>
<td>H</td>
<td>H</td>
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<tr>
<td>Multi-touch</td>
<td>M</td>
<td>M</td>
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<td>L</td>
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<tr>
<td>Touch-and-hold</td>
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<td>Object size recognition</td>
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<td>Measures Z-axis</td>
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<td>High optical performance</td>
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<td>M</td>
<td>H</td>
<td>H</td>
<td>H</td>
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<td>Flush surface (low profile)</td>
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<td>M</td>
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<td>L</td>
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<td>H</td>
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<td>Insensitive to EMI and RFI</td>
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<td>Insensitive to ambient infrared</td>
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<td>Works with plastic substrate</td>
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<td>Low cost</td>
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<td>Scalable</td>
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<td>Simple sensor manufacturing</td>
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Question #3

Do you agree that optical is the future of large-format touch?
Large-Format Forecast

Data from iSuppli’s Emerging Display Technologies 4Q-2009 Special Report

Large-Format Touchscreens in Interactive Information, Education, Training, Conference & Signage (transparent touch only)

Units Shipped/Year

97% CAGR

Data from iSuppli’s Emerging Display Technologies 4Q-2009 Special Report
Conclusions

- **P-cap will dominate in mobile devices up to 17”**
  - It’s already started

- **Optical will dominate in the stationary consumer 15” – 30” segment**
  - Lowest cost multi-touch
  - Most scalable
  - Most full-featured technology

- **Optical will dominate in the large-format >30” segment**
  - Lowest cost
  - Most scalable
Come see the future of touch at NextWindow in Booth B019!
Appendix

Products on display at Display Taiwan 2010
1900 OEM Touch-Screen

- High-volume OEM components
- Microsoft Windows-7 multi-touch logo
- Kit, on-glass or glassless
- 15” to 30”
- Highly durable
- Low cost
- Easy integration
- USB interface
2500 OEM Touch-Screen

- High-volume applications
- Standard sizes from 30” to 52”
- Low cost
- Microsoft Windows-7 multi-touch ready
- Low profile & narrow border
- Kit or on-glass
- USB powered (no external power supply)
2150 OEM Touch-Screen

- Standard sizes from 30” to 103”
- Passive illumination & reduced components yields higher MTBF
- Microsoft Windows-7 multi-touch ready
- Kit or on-glass
- USB powered (no external power supply)
2700 Touch-Screen Overlay

- Integrates over almost any large display
- Adds touch to any computer application
- Protective overlay guards against abuse
- Microsoft Windows-7 multi-touch ready
- Fully compatibility (no proprietary drivers)