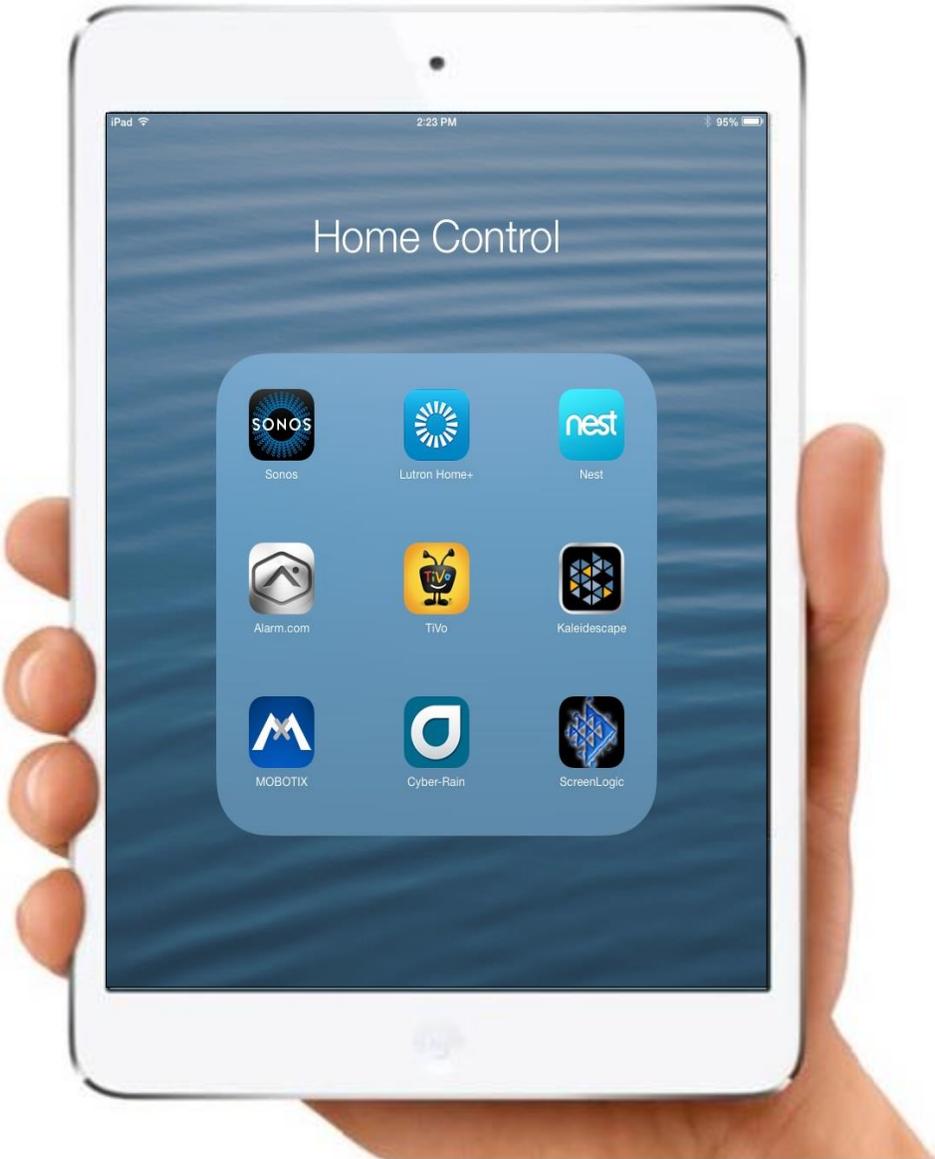


Digital Platform Strategies for the Connected Home

*Best of breed intelligent audio/video and home control solutions
for the custom integrated home*

By Gordon van Zuiden, President, cyberManor



Digital Platform Strategies for the Connected Home

Introduction

Smart mobile devices have dramatically changed the way we live, work, play, and learn. In the same manner that desktop personal computing changed in our lives in the latter part of the 20th century, smart mobile devices are changing our lives at an even more dramatic rate in the 21st century. Last year there were approximately 400 million desktop computing devices shipped around the world (and that number is staying relatively flat). By comparison, there are now over 1.8 billion smart mobile devices shipped every year - a number is growing at 15-20% year*.

The focus of this white paper will be on Apple based AV and home control solutions because of Apple's ongoing innovation in smart phone technologies and dominance in the tablet marketplace. The high resolution retina screens of the Apple iPad and iPad Mini, coupled with the fact that over 200 million of these products have been sold to date, have made the iPad the "de facto" platform for most of the leading home control and AV applications. Since the iPad Mini was launched in late 2012 the dominance of iOS mobile control in the home is even more pronounced - the 7" screen is the ideal form factor for most home control applications. With this newer, lower cost iPad Mini we frequently place these tablets in charging cradles in each room of the home that has music, lighting, or TV control requirements.



* Data from a report from IDC. IDC is a global market intelligence and consulting firm. It specializes in providing market intelligence, advisory services, and events for the information technology, telecommunications, and consumer technology markets.

Many of the solutions proposed in this white paper can also be implemented on Android based platforms – but Apple’s leadership and significant market share have influenced most AV and home control application developers to write their applications for the iOS platform before they embrace the Android platform. As a result this white paper will focus on mobile iOS application solutions for the clients of the custom home technology professional and the key design decision parameters involved in optimizing iOS based AV and home control solutions. These AV and home control solutions are primarily integrated into larger homes – typically over 2500 square feet in size – since the demand for customized home control and AV distribution increases with the size of the home. A one bedroom can have a whole house music system and TV zone all in one room – there is not much of a need for total home control and AV distribution. On the other hand, a homeowner with a 5000 square foot home with 4 or 5 bedrooms, several zones of audio and video, multiple heating and cooling zones, a security system, an advanced lighting control infrastructure and surveillance cameras becomes an ideal candidate for the AV and home control solutions outlined in this white paper. These homeowners will often employ the services of a custom home technology professional for their design and integration work.

Digital Platforms for the Home

There is a paradigm shift occurring in the manner in which electronic products are being designed, built and integrated into the home. A shift that was embraced by Sonos over a decade ago is now becoming the standard by which other residential network connected products can be judged. In 2004 Sonos introduced a music player for the home that was designed from its inception to be a whole house music distribution *platform* that would be enhanced by *software* over time to remain current - instead of a hardware only solution that quickly loses its value. This software upgrade model insured that their music platform would enhance in value to their clients each year - a dramatic shift from the traditional home electronics model of regularly purchasing and installing new hardware to keep up with current feature requirements.

This software enhanced platform model was emulated by NEST when they introduced their elegantly designed intelligent thermostat in 2011. This thermostat was the start of a heating and cooling control *platform* for the home that would be enhanced with software upgrades over time. In only three years NEST has already had 4 major software upgrade releases that have added the following new features and functionality:

- Fully redesigned interface including landscape and portrait display modes - including beautiful, animated outside weather.
- Optimized for the 4-inch Retina display on iPhone 5 and iPod touch
- Arrows to easily increase and decrease target temperature
- Displays energy history
- Can schedule the fan to turn on daily, for a few minutes each hour, or on a timer.
- Ability to remotely lock your thermostat with a 4-digit pin code

All of these software upgrades were free and installed automatically from NEST’s cloud based servers to each installed NEST thermostat in the home.

This fundamental shift in the intelligence and software upgradability of home electronics have set the stage for a consumer expectation that electronic products purchased today should actually improve over time. This new model fosters product loyalty and good will from the homeowner to the manufacturer of the product and the professional integrator that recommends and installs these

products. Instead of frustration and disappointment over the decline of a product's value and functionality over time the reverse is now true - delight that the electronic product purchased yesterday is more useful today than the product was the day before - at no additional charge and without the need for an upgrade service call.

This new digital platform based product model is now flourishing because the following communications infrastructures are now prevalent in the United States:

- High speed always on broadband connectivity is available to almost every home in the US
- Home networks have been installed in almost every home providing wired and/or wireless connectivity to the internet from every room in the home
- A national cellular infrastructure provides internet access from every heavily populated region in the country – allowing remote access to electronic products on the home network
- An iOS or Android mobile control phone can be found in almost everyone's pocket or purse

When a new electronic product is introduced into the home it often follows the following design parameters:

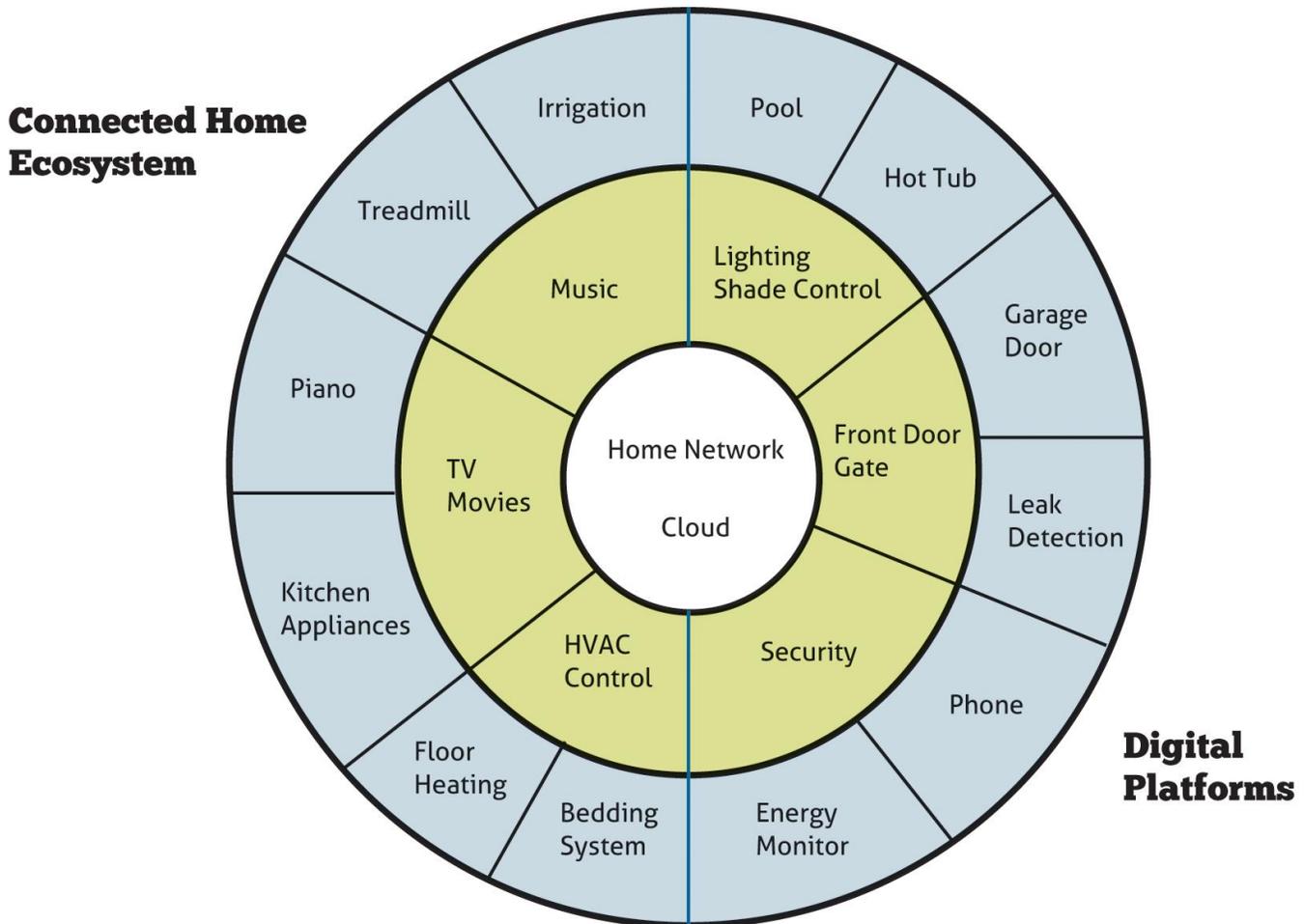
- There is an embedded communications chip set that enables it to connect to the home network over a wired or wireless connection
- The product design is clean, functional and with minimal number of hard buttons - features are added with software upgrades, not hardware replacements
- Control of the device is accomplished via a well-engineered and elegant graphical interface that runs on a wireless smart phone or tablet device
- Typically the manufacturer will have a cloud service that contains information about the state of their product and allows the consumer to control it from anywhere in their home or when they travel

Almost all the new connected home technology products introduced on Kickstarter and Indiegogo follow this formula. But even established, mature companies in the home are following this new software platform strategy. When Jarden Corporation wanted to add this level of network connected intelligence to their Mr. Coffee Pot and Crockpot branded lines they partnered with Belkin to add this functionality by adding the Belkin WEMO line of chipsets and control software. When Serta wanted to add tilt/raise and massage mattress control to their high end mattresses they turned to a Santa Barbara software engineering company to add these app based control features. When the Chamberlain Group wanted the Liftmaster garage door motors to work with app based smart phone control of their garages doors from inside or outside the home they added the appropriate gateway technology and smart phone software to differentiate their high end line of garage door openers.

The list of products adding network connectivity and app based control is growing daily. Even 50+ year Dacor Industries, a high end manufacturer of kitchen appliances, is introducing a high end oven that can be controlled by a smart phone locally and remotely. Samsung and LG have a new washer and dryer combination that can be controlled by a smart phone and NuHeat introduced a high resolution color thermostat for their electronic floor heating systems that can be controlled by a smart phone app. Nordic Track offers an indoor treadmill that lets you program almost any route you would you would like to run in the US and see your course on the treadmill's color touchscreen via Google Street view. As you are running your route on the treadmill the application is smart enough to change the incline up or down in accordance with the actual real world run!

The Modern Home Digital Ecosystem

The following diagram illustrates the relative importance of these intelligent electronic ecosystems in most US homes. At its core is the requirement that the entire home is networked, both wired and wirelessly and connected to high speed always on broadband internet connection. These core networking products (modems, routers, switches, wireless access points) are the foundation for the network enhanced entertainment, comfort, and security solutions in the home.



In the inner primary service ring are the fundamental entertainment, comfort, and security needs required in almost every home - music, TV, heating and cooling, access control, security. In the outer secondary service ring are needs that enhance the intelligence and value of the home but typically follow the adoption of the primary service ring products. These secondary service ring products include irrigation control, health care monitoring, pool/hot tub control, energy monitoring, garage door openers, etc. (See Appendix 1 for specific best of breed product recommendations for many of the platforms shown in this diagram.)

It is important to understand that in this network driven home ecosystem each category will be filled with companies competing to become the digital platform *standard* for a given service need in the home. Companies that foresaw this intelligent home ecosystem model have an inherent advantage in

becoming market leaders in their given category - as Sonos has done for whole house music and NEST in heating and AC control. In the TV distribution space we see leadership from companies such as TiVo, Dish and Direct TV. But in most of the other platform categories in the home we not seen a clear winner. One would expect that in the next few years we will see manufacturers dominate in a given platform based on the strengths of their product design, hardware reliability and commitment to steadily improving the software suite of services for their product.

Keep in mind that market leadership in a given platform today does not ensure dominance in the future. In this new world where software based services enhance the value of a platform over time - a company whose software services are not enhanced on a regular basis will see their leadership position erode to competitive companies that target software platform enhancements as a key strategic initiative for their company. There are many companies that make excellent speakers and amplifiers that fill up a home with music - but very few companies place equal, if not more, focus on the excellence of the software component of the music platform to enhance the whole house music experience. At no additional charge to the homeowner, Sonos has improved their software to complement their whole house audio platform experience almost every quarter over the last 10 years – enabling them to maintain and extend their leadership position in delivering best of breed music services throughout the home.

"We have a lot of opportunity just in the few things we are doing...we have one little role to play in the smart home and that is plenty big for us."

John MacFarlane, Sonos CEO (from a 2013 interview)

This level of commitment to excellence in the product platform over time keeps Sonos in front of its whole house audio competitors and delivers value and delight to their existing customers on an ongoing basis. Given their success it would be very easy for Sonos to extend their control into the other areas of the home such as video distribution or HVAC or security control. But Sonos knows that there is still so much value they can add to the digital whole house music platform that they will not be enticed (or distracted) by pursuing these other areas. Doing so would compromise their engineering resources to deliver the best whole house music experience and open up the door to competition that could threaten their market leadership position. This is a key strategic initiative at Sonos and is fundamental to maintaining and enhancing the market lead they now enjoy.

As a direct result of their success and acceptance into the home Sonos is now a platform that enjoys a third party ecosystem of their own. If you need a Sonos compatible wall mount you can order one from Cavus or Flexson. If you want to turn their platform into an intercom or a public address system you can buy a 99 cent application from People Tech to enable this service. You don't have to look any farther than the iPhone or the iPad to see the importance of becoming an ecosystem platform - software apps and 3rd party hardware products have done more to entrench Apple's leadership position in the mobile smart phone and tablet market more than anything that Apple could have done by themselves.

ASPI Connected Home Model

Another way to look at this shift from hardware to software based feature upgrades in the home is shown in the following ASPI (Application, Services, Physical Interface) connected home model diagram:

ASPI Connected Home Model



In this model of the custom integrated home the physical products (such as speakers, amplifiers, hi resolution TVs, structured wiring, a security system, etc.) have all installed by the custom electronics integrator. Once this physical hardware plant is in place the entertainment, comfort, and security value of the home can now be enhanced by software improvements to the respective physical hardware platforms, iOS and Android touchscreens throughout the home. The home's livability actually improves over time - but the critical decision for the homeowner and the custom electronics integrator is to select the manufacturer of a digital platform for a given service that demonstrates the financial commitment and committed engineering resources to innovate and add value to their platform on an ongoing basis.

This represents a fundamental difference in how one selects the best product for a given category - it is less about what the product feature sets are today but how they can be enhanced tomorrow. For the first time we think of technology as an investment that *increases* over time if we pick the correct platform today.

When we choose a pool or hot tub controller - do we pick the one that has the most button feature sets on the wall or one that we can use from our smart phone that adds remote control capability, shows a history of the heating furnace usage, and perhaps has a unique temperature setting for each person that uses the hot tub. Which pool control company will dedicate the engineering resources to ensure that they become the leader as a pool and hot tub control platform?

Now it is more important that we gauge a company's commitment to their platform enhancement efforts than the product specifications that the company delivers today. The net value of their technology to the homeowner will not only be measured by what it can do today - but what will be its aggregate value to the customer over the life of the product.

Single App Home Control vs. Multiple App Home Control Solutions

While a single application total home control solution would seem to be very desirable over using multiple applications to control the home - the reality is that this model can actually stifle the innovation of the digital platforms that they control for the purpose of providing a unified control system. If each time Sonos and NEST improved their product platform on iOS and Android devices they would also have to ensure compatibility with the total home control platform operating systems (or this effort would have to be taken on by the total home control platform or a third party) this would inherently be a drain on both Sonos and NEST engineering resources to keep on improving their own platform in the iOS and Android operating system markets. It also represents a significant support issue when the Sonos and NEST's of the world need to maintain compatibility with a system that is not only controlling their system but all of the other digital platforms in the home. If the NEST thermostat calls for heat, it's freezing outside and it doesn't turn on - is it NEST's problem, the furnace, the home network or the overall control system? NEST is responsible for troubleshooting the first 3 causes of failure and would prefer not to add another cause of failure due to a potential issue with the unified home control platform.

Besides the potential restriction on platform product innovation and increased support issues - having one application for total home control doesn't really make a lot of sense in a world where all of us are comfortable using independent apps for independent purposes. We already use one app for email, another app for maps, another app to surf the web - so we are already used to an app to perform a specific function. Granted we don't want 100 home control applications to sift through to open the front door - but if we pick one best of breed application for the home's primary functions we can keep all of those apps in one easy to find folder and label it home control (see the cover image of this paper).

We have also found that while our clients think they would like to have whole house automation functionality - in reality they rarely use these functions. Most often they use an application for a specific task - such as listening to music or turning up or down a thermostat. The automated scene that starts when you get out of bed and the music turns on, the drapes open, the lights ramp on and the

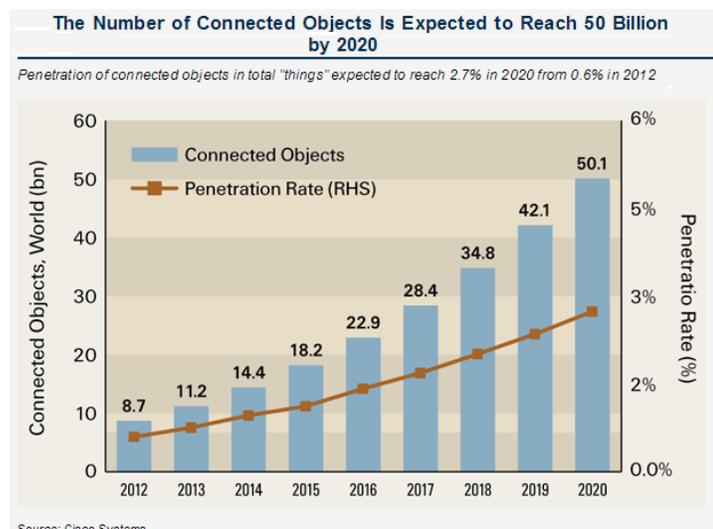
thermostat heats up the room sounds wonderful at first - but over time these scenes lose their luster – especially when they get out of sync and they start or stop at the wrong times.

An oft repeated argument *for* a single home control application is the interoperability – or automation – between subsystems. One wants to leave their home and arm a security system that will automatically turns off all the lights in the home – an automation function can easily be programmed into a single away button on a total home control platform – no need to open up multiple applications to complete this task.

But even that argument is losing ground since these automation services can now be enabled in the cloud – and not only in a local total home controller. Several manufacturers are now transferring the control information in the home to their own servers in the cloud (such as Lutron and Alarm.com). As more and more home AV and control information is stored in the cloud these various subsystem companies can port information back and forth to automate the functionality of the subsystems in the home. Alarm.com is an example of a security company that knows whether a home is in an armed or disarmed state on their cloud based servers. Now when one arms a security system powered by Alarm.com it can send this armed information state to the lighting control information (stored in the Lutron cloud) and request that Lutron turn off the home’s lights – subsystem interoperability is enabled without the need for extensive custom automation programming or a local home control processor.

Another manner in which apps can communicate with each other is via app scheme URLs. When an app supports this URL call – such as the Kaleidescape app – then one app can open up of another application from within the initial application. A good example of this is within the Roomie Remote universal remote control iOS application. This is one area where having one application control multiple devices is a necessity since you need to control a TV, a receiver, and an AV source device from one application that can universally control all of this equipment from different manufacturers. In the Roomie Remote - Kaleidescape example – depressing the Kaleidescape icon with the Roomie Remote Universal app interface will turn on the TV, the receiver, source the receiver to the Kaleidescape input and bring up the Kaleidescape app graphical interface within the Roomie Remote interface. This is the best of both worlds – Roomie Remote for Universal Remote Control and Kaleidescape’s great movie selection graphical interface. Manufacturers may also open up their API’s to total home control manufacturers (as NEST announced at CEDIA in the fall of 2013) – the issue is that the total home control’s software implementation of the control interface is rarely as good as the manufacturer’s own implementation – and almost always lags the manufacturer’s GUI upgrade releases.

As a final point, the definition of the overall scope of total home control is not well defined. Commonly one thinks of these control systems as controlling the whole house audio, TV, HVAC, security, and the camera and access systems in the home. And perhaps the pool and hot tub. But where does control of irrigation systems fit in? Or health monitoring systems? Or kitchen appliances? As these systems are added to the home network there are separate apps that are needed to control these various platforms and the



benefit of a single home control application starts to erode. It used to be that all of these subsystems did not have embedded processing intelligence and they had to be managed by a centralized home control server - that is no longer the case. The internet of new things entering the home is exploding at a phenomenal rate (see diagram from Cisco above) and those systems that survive or die will do so on the merits of their platform working well on iOS or Android operating systems - not on their compatibility with a total home control platform.

But it is not all doom and gloom for high end total home control systems. They are and will find success in markets where integrated product platforms need to have one standardized interface to ensure the control experience is easily understood and operated by hundreds if not thousands of individuals in a given location. This environment exists in the corporate boardroom where the platform is defined as an integrated AV control experience, or the hotel or hospital room where the room's lighting, TV, or HVAC represent a unified control platform experience for employees, guests or patients. These systems are only modified when approved by the corporate IT staff of these organizations. They are tightly controlled to make sure the control experience to the user of the boardroom or the guest of the hotel or patient in the hospital is always the same and works reliably. *This model of a total control system for a defined suite of subsystems controlled by many different users is fundamentally different than the individual home where a wide variety of subsystems are used by one family at a time.*

The other scenario where a different breed of total home control companies will enjoy success is in the mass market where there is price sensitivity to the high cost of custom integration of premium digital platforms. Companies like AT&T Digital Life Platform, Comcast Xfinity Home Control, Honeywell Home Automation and many others are enjoying success by offering a limited, defined, standardized suite of home subsystems that will have on-going software compatibility with their total home control solutions. These systems are relatively inexpensive, generally require a monthly subscription, and perform basic home control functions well. *But they will never be able to offer best of breed premium systems to their clients because their expertise is in the aggregation of control functionality across a limited set of digital product platforms - not in the enhancement of each of the individual digital platforms.* As large as Comcast and AT&T are they are no match for the razor sharp engineering focus of a Sonos or NEST that continues to enhance their respective platforms. Their integrated platform experience will always be a subset of the customized experience provided by dedicated platform companies.

But this is no different than the experience of selecting McDonald's for dinner versus the high end restaurant in town. One offers a very limited and predictable menu that is inexpensive and serves the needs of the mass market - the other offers an enhanced menu that is customized for the unique tastes of their clients at a much higher price. They both offer a meal as their service and they both succeed in their respective markets. McDonald's will never be the high restaurant in town nor should the high end restaurant try and cater to the mass market.

The same model applies to the custom electronics integration channel. We serve high end clients that demand from us a customized experience they can never get from a Comcast or AT&T offering. It could be argued that the offerings from Comcast and ATT only enhance our position in the home because they stimulate the demand for home control with their low prices and their mass market advertising. When the customer discovers that their offerings are very limited they will come to the custom integrator to meet their specific needs.

Summary

Today's connected home is far different from the home we lived in just a few decades ago. In the early 1920s and 30s electricity was first installed in homes and it dramatically changed how we enjoyed our homes – this utility enhanced our entertainment, comfort and security. Today's network connected home, tied to an always on broadband internet connection, dramatically enhances and extends these same services – to anywhere inside or outside our homes. The challenge over the last decade has been to reliably manage and control all of these new services that can enrich our lives. The widespread adoption of smart mobile devices from Apple and Android based companies have given manufacturers of entertainment, comfort, and security systems the ubiquitous interface that makes it much more intuitive for homeowners to manage, control and enjoy the full, rich range of capabilities of these subsystems. Total home touchscreen based control was traditionally available in the form of expensive total home control processing equipment, custom touch screens, and custom programming for a finite set of supported manufacturers. Today almost any manufacturer can update their product with network connectivity and write an easy-to-use iOS or Android software application to control their product – they only have to ensure compatibility with an IP based home network and the Apple and Android operating systems and they can place the control of their product into the hands of hundreds of millions of homeowners. From thermostats to garage doors to door locks to pool/hot tub controls – this trend towards product intelligence, network connectivity, and iOS and Android control is rapidly changing the landscape of how we enjoy and control our homes. These systems, when properly designed and integrated into the home, will forever enhance the way we live, work, play, and learn.

Case Study – Day in the Life Scenario

In this case study we will bring the iOS world to life – showcasing examples of how an iOS enabled home enriches the daily life for a couple named Don and Barbara Jones.

Friday begins early at 6AM the Jones residence with the soft music of James Taylor coming from their iHome alarm clock application on the iPod stationed at the head of the bed. Don reaches over to turn off the alarm and at the same time opens up the Lutron application to draw back the motorized curtains in the bedroom and turn on the bathroom lights. As he gets ready for work he turns on the iPad that is stationed by the bathroom sink, launches the TiVO application that streams live news TV coverage of the weather, stock, and traffic information for the day.

Barbara wakes up to go the kitchen to make herself a cup of coffee and pauses in the hallway to open the Sonos application on the iPod mounted in the kitchen cradle to play Smooth Jazz music from the integrated ceiling speakers in the kitchen. She loves the premium Sky.FM smooth jazz internet streaming service – it's always on at the touch of a button and never plays advertisements. Barbara then goes into the family room where she starts her morning workout using a DVD video from Jillian Michaels. She picks up the iPad in the family room and launches the Roomie Remote application to turn on the TV, the receiver, and the DVD player – all with the touch of a single button labeled "Play DVD". She adjusts the volume up of the workout DVD with the physical volume button located on the side of the iPad.

As Don leaves his home to go to work he can't remember whether he closed the driveway door so he reaches for iPhone and launches the Liftmaster application which shows him that the garage door was still left open – he taps the garage door icon and the door closes. Back at home, when Barbara completes her workout she opens up another application on the family room iPad which will turn on the home's hot water recirculating pump – so that when she starts her shower in a few minutes it will immediately have hot water. Barbara loves this application - it saves water and energy from not having to keep the hot water recirculating pump on all day.

As Barbara drives off to attend a school board meeting she realizes that she forgot to set the home security alarm the home on her way out. She reaches for her iPhone and launches the Alarm.com application to set the house alarm. And in her rush to leave for her meeting Barbara remembered that she left the home heating system on so she launches the NEST thermostat application and reduces the temperature of the home from 72 degrees to 50.

Don is now in the office and after his morning staff meeting and he gets a ring on his iPhone that someone is at his home's front door. He launches the Mobotix application on his iPhone and can see that his neighbor Tom has come over. He can hear Tom say on his iPhone that their dog escaped into their backyard again and wants to know if he should keep the dog at his house for the day or return him. Don tells his neighbor that he is disabling the home alarm security system and opens up the home front door with the Lock State Connect door lock application from his iPhone so that he can put their dog back in the home. Impressed, Don's neighbor asks him to give him the phone number of the custom installation company that provided these features – he wants to add them into his own home!

Before heading to her office from the board meeting, Barbara stops for lunch at her favorite delicatessen in town. She has an hour before her next afternoon meeting and she opens up her iPad to launch the TiVo application that recorded and stored the previous evening's show of 60 Minutes. The iPad has not only become her main home control tablet but now it serves to deliver her TV, music, and movie entertainment when she is on the road.

Don is ready to come home from a difficult week at work and is ready to soak away the stress of the work week in their backyard hot tub. To conserve energy the hot tub has been turned off during the day - but on his way home he turns on the Pentair hot tub control application from his iPhone so that the hot tub is on and heated by the time he arrives. Also, on his commute home he remembers to turn up the NEST thermostat so that the home is comfortable upon his arrival.

Barbara is also heading back home after a day full of meetings - when she pulls into the driveway she notices that the front lawn looks pretty dry. Normally the programmed sprinkler system automatically waters their lawn but the last few days have been warmer than normal. Barbara launches the cyberRain irrigation application from her iPhone and selects the front lawn watering zone to manually turn on for the next 15 minutes. In anticipation of guests arriving at their home tonight she opens up the Lutron application to turn on the front and backyard landscaping lights and the Pianodisc application to softly play the piano in the home's entry way.

It's 7:30 PM and Don and Barbara's friends have arrived to join them for an evening BBQ in the backyard. Don picks up his iPod to open up the Sonos application to stream his favorite Pandora music station in the backyard. The San Francisco 49ers are playing a Friday evening game and their guests are interested in seeing the game. Don mutes the Pandora music from his iPad and launches the TiVo application to start streaming the football game to the iPad from the TiVo in the family room. When they are all about to sit down for dinner, Don pauses the live TV stream on his iPad and they can watch the rest of the football game after dinner from the TiVo connected to the family room TV.

Night falls and as the Smith's climb into bed after an active week and they can't remember if they turned off the backyard landscape lights. They pick up the iPod by the bed's headboard and open up the LockState Connect application to lock the front door and the Lutron application to turn off the backyard landscape lights. And while the Smith's are recharging their batteries with a good night's sleep – the iOS devices around the home are recharging their batteries to be ready to assist the Jones's family on another full day of AV and home control activities.

About cyberManor



Gordon van Zuiden is the Founder and President of cyberManor (<http://www.cybermanor.com/>), a full service home technology integrator headquartered in California's Silicon Valley. With over 15 years of experience in the sale and support of personal computer and networking products to corporate accounts, Gordon founded cyberManor in the summer of 1999, one of the nation's first custom electronic integrators to focus on IP based technologies for the home. cyberManor's mission is to design, install, and integrate Internet-empowered home networking solutions that enhance the entertainment, communications, and comfort of their client's homes.

Mr. van Zuiden's vision for the digitally connected home has been inspired by discussions with the executive staffs at Sonos, NEST and TiVo, and the insights and wisdom of CEDIA's thought leaders Rich Green, Peter Aylett, Michael Stein, Mat Lindstedt, Dave Pedigo and Michael Heiss.

Mr. van Zuiden served 6 years on CEDIA's Board of Directors (CEDIA represents the Custom Electronics Design and Installation trade) and has served for three years as the co-Dean of CEDIA's Electronic Systems Design Track, developed the certified CEDIA ESD course on Digital Home Electronic Solutions and has consulted on the development of COMPTIA's HTI+ Network Certification program. He is also a monthly columnist on home networking topics for Residential Systems and Electronics House magazines. Mr. van Zuiden has taught courses or been a panelist on Digital Home Entertainment and Networking Solutions at the national trade shows of CES, CEDIA, ehExpo, CEPro Summit, National Kitchen and Bath Association, IEEE, and internationally in Digital Home Expos in Russia, the Netherlands and Mexico over the last decade. He has also been a consultant to industry manufacturers and custom integrators across the United States, teaching full day seminars on the applications and benefits of networked home technologies.

Mr. van Zuiden graduated with a BSME degree from Stanford in 1977 and an MBA from UCLA's Anderson school in 1983.

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Appendix 1

The following table is a compilation of most of the AV and home control applications that are referenced in this white paper. They have been chosen because of the successful integration experience we have with these products for our clients – and my own home. But this is far from an exhaustive list – in any given system category – entertainment, comfort, and security there are dozens of manufacturers that have iOS and Android based control solutions for their products – and that list is growing daily. The value of the custom electronics integrator will be to choose and integrate these “best of breed” hardware subsystems and iOS and Android applications that will best fit the needs of a given client.

Category	Company	Website
Heating and Cooling	NEST	www.nest.com
TV Watching and Recording	TiVo	www.tivo.com
Whole House Music	Sonos	www.sonos.com
Whole House Lighting	Lutron	www.lutron.com
Security System	Alarm.com	www.alarm.com
Universal TV Remote Control	Roomie Remote	www.roomieremote.com
Movies	Kaleidescape	www.kaleidescape.com
Monitoring Cameras	Mobotix	www.mobotix.com
Irrigation	cyberRain	www.cyber-rain.com
Pool and Hot Tub	Pentair	www.pentairpool.com
Door Locks	Lock State Connect	www.lockstateconnect.com
Front Door Entry Station	Mobotix	www.mobotix.com
Garage Doors	LiftMaster	www.liftmaster.com
Phone Systems	Invoxia	www.invoxia.com
Player Piano	PianoDisc	www.pianodisc.com
Weather Station	WeatherHawk	www.weatherhawk.com
Energy Management	SiteSage	www.powerhousedynamics.com
Alarm Clock	iHome	www.ihomeaudio.com