The Television Computer

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Worry is a Waste of Imagination

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Preface

The purpose of the book is to introduce the concept of the Television Computer. The Television Computer dramatically improves the quality of life in the age of television. It is this improvement to the quality of life, to the quality of day-to-day living, that puts the Television Computer squarely in line for a significant position in the progress of society. As odd as it may seem at first, the Television Computer provides for the first real home robots in the sense that we really want robots, as unobtrusive servants.

This is a "utopia book" that will describe the Television Computer and the associated new economic environment that can cause the improvement to the quality of life. Being a utopia book, the year is set to be 1998, several years from now.

The Television Computer**,** or TC, is a computer. But instead of receiving keyboard input from a human operator, it is connected to standard cable broadcast. The cable operators offer data channels solely for the use of the Television Computer. The computer programs are called "applications" or "apps," and the information, listings, or messages are called "info." Apps and info can be created by anybody with their personal computer or PC, although most people just ask their Television Computers to watch for things to happen, to do, or to know about.

We begin in utopia. Television Computers have been around for four years. Ten million have been sold. High definition televisions, many of which contain Television Computers, are still an oddity with two million sold. Television Computers required little technical innovation, but they did require business innovation provided by the company Television Computer, Inc. Many more people are involved economically in television than was thought possible in the 1980s.

The chapters of this book are laid out as follows:

1) **The Television Computer.** The introduction of the device called a Television Computer.

2) **A New Economy.** The Television Computer, the software written for it, and the franchises to distribute these goods and services provide economic stimulation.

3) **Killer Applications.**   This includes a survey of applications available on the Television Computer and how they function in people's lives.

4) **Publishing Info and Apps**.   Publishers control the dissemination of information. It is in understanding the roles of publishers that the practicality of the Television Computer becomes apparent.

5) **Non Consumer Television Computers.** The industrial, commercial, medical, governmental, and military configurations that massively extended cable broadcast to industry.

6) **Creating Info.** Television computer messages are supported by various applications. This chapter describes how information is constructed for broadcast or for loading to applications.

7) **Creating Apps**. This chapter describes how software applications (or computer programs) are written for the television computer.

8) **Getting Started**. This chapter describes what people must do to get the new economy off the ground.

This book interleaves a novella with the technical description. *Randy Jr. says, "It is kind of like switching between two television channels."*

The origination of the idea was in the Imaging Systems Laboratory in the Robotics Institute at Carnegie Mellon

Chapter 1
The Television Computer

The crowd applauded as Glenn Williams rose from his seat to take the podium. The keynote address at COMDEX, the computer exhibition, was to be short. Over 6,000 people were watching. Glenn, looking out from beneath his brow, held up his hand half high, and smiled to bring the audience down. He was not the young computer entrepreneur. He was not young, but he was considered a cowboy.

"As you all know, I am not a computer person. But here I am, standing in front of you, and you applaud even before I speak. There are some businessmen I know who would be thinking about P.T. Barnum right now."

"A sucker born every ..." Randy thought to himself. Randy Thompson was one of those who did not applaud. He had read about Glenn for years and seen him on television. He was in Las Vegas because it was an easy drive from L.A. and this was an opportunity to meet with international people who wanted to get studies of the computer industry. The talk by Glenn was fortunate.

"You probably think I am a cable television person. The truth is that I made a lot of money in cable. But the real truth is that I am technophobic, computerphobic, and telephobic. I would probably be radiophobic if anybody cared to call me a radio entrepreneur. I am about as phobic about all this stuff as anyone can imagine. I have no technical vision, no vision of the future.

All this stuff scares me. I went into the exhibition hall today and felt like a scared puppy. You know, a scared puppy crouches down and shivers when it can't figure things out. I have not the faintest idea about what most of ya'll talk about most of the time. Ya'll sound like a master I cannot understand."

"The other thing a scared puppy does, if you push it far enough, is bark."

He paused then continued, "I just like to set things straight."

The crowd applauded. This is what Glenn always said.

"The television computer is my weapon against computers. Its my way of keeping all you computer people away from me." Laughter.

"In fact, I wrote those guys at Television Computer a long time ago and told them they should change their name. I am here to say that I was right then and continue to be right now. I think the name should be the Television Anti-Computer. Maybe if we mix enough TCs out on the exhibition floor with enough PCs, all the PCs will vanish." Glenn paused. "Television Anti-Computers are here to stay." He smiled, "I win."

Glenn's hands were griping the front of the podium tightly. His blue eyes were sharp. He would wait a few more moments. He was taking on his personality as a top businessman. He was over fifty, but he was totally driven by his mission.

Randy looked up, but he had started thinking about the last year, since he decided to buy a television computer. He could remember the year clearly. Glenn was not saying anything new.

Randy went to the television department and picked up a plain TC, because he was finally fed up. He was tired of constantly tuning past uninteresting channels. He was tired of worrying about what his kids were watching on TV. He was tired of

spending days, weeks, and months on finding a carpenter. He did not want another day of his wife complaining that they could not go out because she couldn't find a baby-sitter. He was tired of not knowing if there was a place within 3-5 minutes drive where he could find a pair of Levis. He really wanted to know the guys around him that were interested in Saturday morning golf, not for business, but for fun. He wanted to see if the investment applications on the TC worked as his friends said. But most of all, he knew that people who had TCs were taking vacations using money they made because they had them, and he was tired of watching that happen.

Let's watch Randy's story, but the purpose of this book is to talk about the structure that underlies this story and other stories. How was it possible that such services could be delivered on such a scale and so quickly? Nobody, in 1992, could have imagined how the existing cable system and the existing TVs could be so simply used with such dramatic impact. It was still old broadcast-only TV. Interactive TV, while continuing to be experimented with, is still not widespread. High definition television is in a similar state. It seemed unimaginable that a revolution in television could take place by a cable industry initiative that involved no substantial change to the TV infrastructure.

Randy took the TC home and plugged it into his TV like he plugged in the VCR. He watched with satisfaction as the TC automatically found the "data channel." He hit the "info" button and the TC welcomed him with the news that it knew that today was March 3, 1997 at 6:58 PM and that the TV programs for the week were available to browse. He searched with satisfaction for the time for the TV Scheduler Plus application in the applications listing. He pressed the key to get the application when it played that evening, sat down in his chair, and started perusing the applications listings for other applications he might recognize as interesting to have.

The Television Computer or "TC" was a key element of the revolution. Let us start the analysis, as one might start after

buying a TC and reading the instructions. Without knowing what people buy, it is hard to see who buys it and why they buy it. This chapter does not discuss everything associated with Television Computers. It talks about equipment, not about software and services delivered for the equipment. Later chapters address software (Killer Applications) and services (Publishing).

The Brown Box

The original idea for the TC came from Robotics. Here is the basic idea of what has now become known as the brown box.
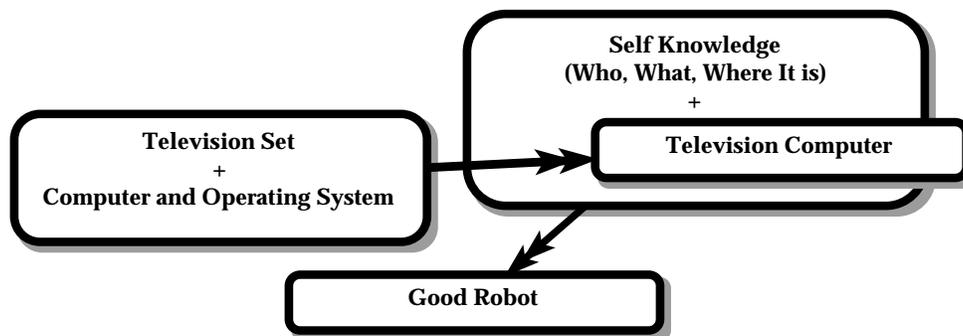
Certain ingredients make a good robot to have around. A TV combined with a computer and operating system makes a television computer. Combine this with self-referential knowledge, who, what, and where the computer is, and you get the basis for a good home robot. This is a talking and thinking robot, not a walking and manipulating robot. It is a friendly servant on the home TV. The home TV is a remarkably sedentary device; it does not need to move around to be a good robot. It does need to have a television computer to be smart enough to be a good robot.

The physical device is a part of broadcast television. It is linked to the umbilical cord of cable television. There are some locations where the umbilical is direct satellite broadcast and others where the physical connection is telephone and cellular radio. In all cases, the Television Computer is a slave, itself, of its broadcast master and its local owner.

```
┌─────────────────────────────────────────────────────┐
│           Television Computer Model                  │
│  ┌──────────────────────┐    ┌────────────────────┐  │
│  │  Broadcast Source     │   │ Television Computer │ │
│  │  N Program Channels   │──▶│ Knows Self and Lat/Long │
│  │  M Information Channels│   │ Decodes Information  │ │
│  │                       │   │ Runs Applications    │ │
│  └──────────────────────┘    │  ┌──────────────────┐│  │
│                               │  │ Television Set   ││  │
│                               └──┴──────────────────┘  │
└─────────────────────────────────────────────────────┘
```
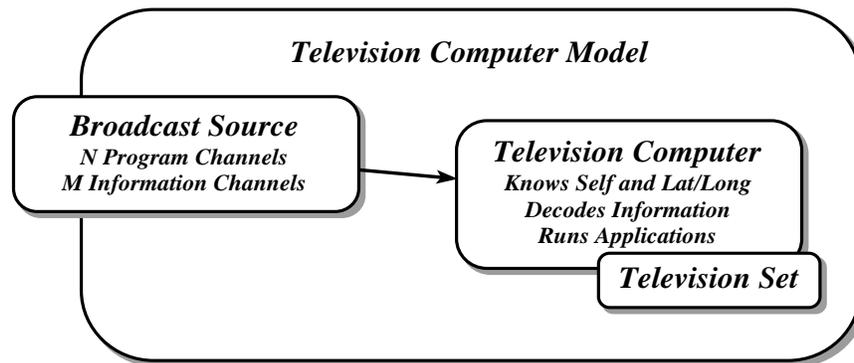
A Television Computer has a list price of about the same price as a VCR and a few times the price of a cable decoder box that it can replace. It makes sense to find that the newest VCRs and TVs that contain Television Computers inside are priced to add the Television Computer cost.   However, since the Television Computer can share a tuner with the VCR or TV, and the same connectors, power supply, and other odds and ends, an embedded Television Computer is generally less expensive than one that stands by itself.

Randy and the kids were walking into the family room after having worked on the shrubbery in the yard. The TV came on magically and tuned the nightly business report. Randy Jr. said "Neat, but wrong channel, Dad."

Dad had gotten a programming scheduling app from somebody that could turn on the TV automatically. "As long as we only use the TC to turn on and off the TV, it will work," said Randy.

Anne said, "Dad, if we buy a TC TV, it will always work."

Dad said, "Good luck." He figured to get rid of that app. It was interesting but too hard to use. Maybe if they had that 'person sensor' he read about in Byte Magazine, the TV would be more sensitive about when to turn on and off.

Most stand alone Television Computers are dark brown slabs about the size of a large, but thin, bound book.   They sit under or on top of the VCR, on top of the TV, hang on the side of the TV, or (small) TVs sit on them. Here is what the front and back of the Television Computer looks like:

Front

| Television Computer | ▬▬▬▬ | 45 12 |

The front panel contains an illuminated display with both the tuned program channel and the tuned data channel (slightly smaller and to the left).   An "I-" appears just before the data channel if the "interactive TV" resource is in use by any application.   There is a dual infrared window for infrared send and receive. The infrared send is a blaster that can control TVs, VCRs, and the like that might be sitting in the room.   The slot on the front panel holds a memory card (similar to a credit card) that can be used for apps and extra memory.

A second version of the Television Computer is common:

Front with Frame Buffer Graphics

| Television Computer * | ▬▬▬▬ | I- 45 12 |

The basic Television Computer is $299, but this one is $599. It contains a graphics frame buffer. The basic version, like most VCRs, can only write alphanumeric characters to the display. The Television Computer* can write graphics windows to the display. The reason for the simple distinction with a star is that this gives a simple way in app listings to distinguish between apps that require the graphics capability.

The TC displays given in this book are all for the Television Computer without graphics. Examples of some of the differences are given in the sections on creating info and creating apps.

Back

On the back are Video and Audio RCA Jacks, and Radio Frequency (RF) in and out, using the standard RF coaxial cable connectors. There is an on/off button. There is a digital interface that is a serial computer connection through a telephone-type wire jack (RJ9). The digital interface enables anyone to connect the television computer into his personal computer to achieve a variety of special functions including the important ones of creating info and apps. There is an optional plug-in to augment the digital interface that includes three RJ9 jacks. The two additional jacks are for a telephone connection, "line in" and "line out." But more generally the Television Computer is connected only to the cable and the television or VCR.

The Television Computer is wired in various ways but here are two common examples.
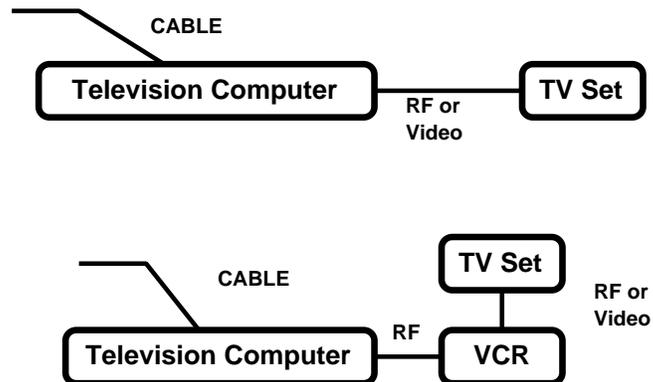
The wiring for a Television Computer embedded in a TV with an external VCR provides a separate wire for the TC data channel:

```
CABLE                           TV Set
        splitter            Television Computer

                          RF or
                          Video
              VCR
```
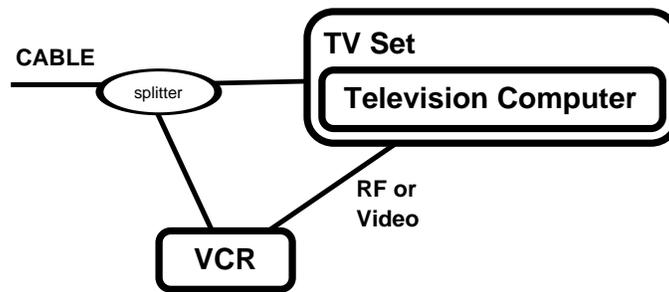
The use of cable is not absolutely required, but much of the value of the Television Computer to a customer is provided by local cable. This will become obvious in the discussions of local apps and info. Antenna reception is not reliable for data channels and satellite receipt is often too imprecise in region. With a VCR attached, the Television Computer can use the VCR for digital "backup" of data.

Within two weeks, Randy had settled into about ten applications that he found were useful from the free listings. He started looking mainly for new listings and some of the paid services. He had already bought a year of local shopping maps for twenty-five dollars on his VISA card, but now he was looking at premium services for investments and the like. He had made a phone call to advertise his interests in golfing on Saturday morning for people within a mile of him, and a new guy, he didn't know, called him. They talked, and had a game set up in two weeks. It cost him four dollars to place the ad every two weeks for six weeks. Amazing.

Randy had already had, by this time, the family discussion of TC usage. He would get 300 kilobytes for his applications, his wife, Marilyn, would get 300 kilobytes for hers. The kids, Randy Jr. and Anne, would have to figure out how to share their 800 kilobytes. He had promised his wife a memory upgrade to quadruple the allotments. Heck, he had already saved the $160 cost. He figured for another $200 he could buy the software toolkit and be an "info entrepreneur" himself, and his family could probably make an additional three or four thousand dollars a year. That was the vacation. He could not believe it. The system worked.

The Remote Control
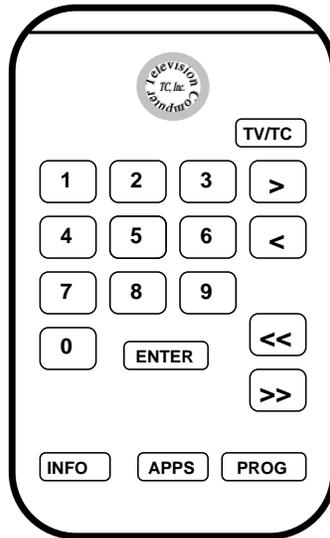
This is the remote control for the basic TC and TC*. There is an alternate form for use with the TC* that supports "point and click" style interaction with a touch pad. For right or left handers the "mouse button" is the squeeze button to either side of the finger touch pad:
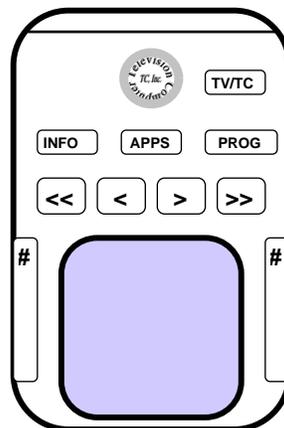
When Randy first looked at the system, he thought that the lack of buttons on the TC itself was a problem. His experience changed

his mind. Regular remotes were $15 and the TC could tell his remote from his wife's remote. This was useful when several people used the same TC.

Here is an all-in-one learning remote available:

SELECT   DISPLAY

| TC | TV | ON |
| VCR | AUX | OFF |

TV □   CH ▲ ▼

1	2	3
4	5	6
7	8	9
0	ENTER

VOL ▲ ▼

TC □
INFO APPS TV/TC

VCR □ PROG TV/VCR
<   RECORD PAUSE
<< ■ > >>

LEARN   ERASE
□ TEACH □ LEARNED
A B C ☀
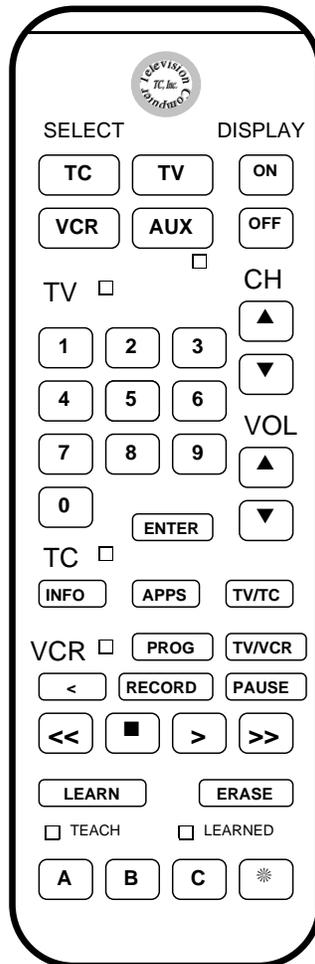
This remote control is made to play other devices, such as the TV and VCR directly, using the "learning remote" methodology widely enjoyed in the late 1980s. The Television Computer shares controls by selecting **TC**, **TV**, **VCR**, or **AUX**: Each button has a light that tells the person which mode is active. In TC mode, there are special Television Computer commands, such as **TV/TC,** that turns on TC control of the program channel selection mechanism. **INFO** displays the Info Listing, and **APPS** displays the Apps Listing (listing of apps currently loaded on the TC). The

TC uses other keys that are used by other devices such as the number buttons, the channel and volume buttons, the **ENTER** button, and the forward, back, fast forward, and fast back buttons among others.

When the Television Computer is embedded inside the VCR or the TV, the VCR's or TV's remote control has the **APPS, INFO,** and **PROG** buttons to operate the Television Computer.

This section will focus only on keys that have special Television Computer meaning, **PROG**, **INFO,** and **APPS.**

Marilyn did not understand the TC at first. She thought it was another computer contraption that took a lot of work to learn and operate. Randy's enthusiasm for the TC had translated into his buying a learning remote for $100. She still had not touched the thing.

One day she was watching the old movie "Harvey," and suddenly, on the screen, was the message "Water Alert, Water feeding your house will be contaminated, Press INFO for Details." She had never pressed INFO before but pressed it anyway. It said there were two messages and to "Press 2" for the "Water Alert." She pressed "2." Now she had the details. The contamination was due to a water main rupture feeding her house.   Water for drinking should be boiled until a message is sent cancelling the alert.

She pressed **INFO** *again, and looked at the first message: "Poodle Pup Found." "Wait an minute," she thought. It said that a male poodle pup has been found for sale less than 10 miles away and gave a phone number.   She pressed the* **APPS** *button and there it was, Find a Puppy*. *Randy or one of the kids was looking for a puppy? She would have a talk with Randy. She walked over to the Television Computer. On the side was one of those memory cards. On it was written, "How to use the Television Computer." She plugged it in, and a message appeared to look in* **INFO.** *When she pressed "3" for the "How to use" message, she learned the Television Computer.*

The PROG Button

The **PROG** button in **TC** mode invokes the TC Programming display:
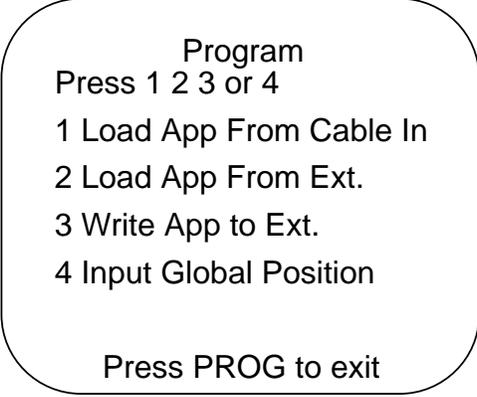
```
                Program
        Press 1 2 3 or 4

        1 Load App From Cable In

        2 Load App From Ext.

        3 Write App to Ext.

        4 Input Global Position


          Press PROG to exit
```

Each of these actions is important to a basic understanding of the Television Computer.

1 Load App From Cable In:

```
Load from Broadcast

Type Numeric Code Number
    for App from Listings

__ __ __ __ __ __ __ __

   Press Enter to Load
   Press PROG to exit
```

An app is loaded from the Cable In (or Broadcast) by keying in the code number for the app, or by selecting the app from an app listing. The basic unit only supports loading by a code number. However, some cable companies have added app listings. These are apps available for the viewer to load. Apps "play" at different times of day determined by the code numbers. Viewers in some areas can read the App Listings in their newspapers for the apps and their code numbers.

2 Load App From Ext. and 3 Write App to Ext:

An app can be written onto or read off a memory card. One memory card can both provide additional memory for the Television and act as a non-destructive memory for apps and info. Some memory cards perform an "autoload" in that just plugging them into the slot loads an application. This manual loading operation is for the case where the memory card does not, itself, perform the autoload. The load operation brings up a listing of the apps that are available to load in either direction into or out of the TC. The viewer then selects the apps to load and presses the indicated number button to load the app.

The screen for **2 Load App from Ext.** is:

```
 Load
Press 1 or 2
 1  Load from Memory Card
 2 Load from VCR



      Press PROG to exit
```
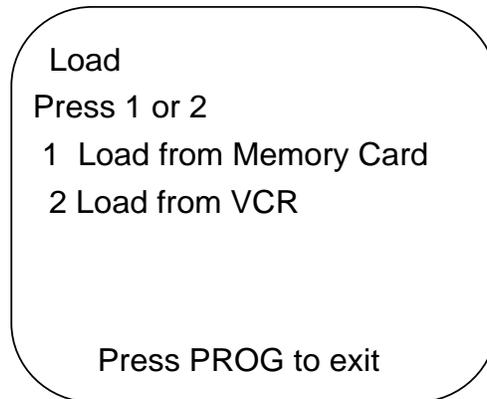
Apps and info also play off a VCR tape if the VCR is playing a data tape created with the Television Computer.   Press **2** in the above screen, and the following screen is displayed:

```
 Load from VCR
Press 1 or 2
 1  Do Whole System Restore
 2 Do Selective Restore
After Pressing 1 or 2 you
have 5 minutes to run VCR.
TC will prompt.
      Press PROG to exit
```
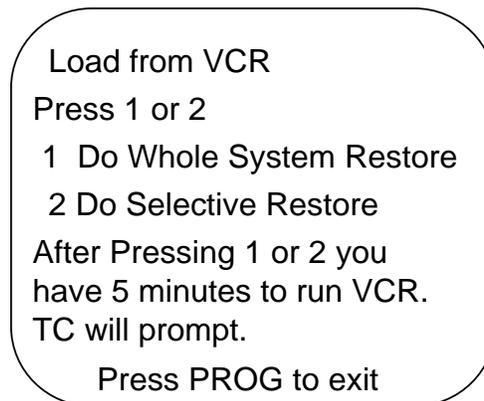
When the VCR is playing data to restore applications to the Television Computer memory, the TV screen shows the blue screen with the name of the app concurrently being restored. The data on the VCR is stored invisibly so that anybody can play a data tape on any VCR and visibly read the names of the apps that are stored on the data tape.

Apps can be loaded or read through the digital interface connected to a PC, but this process is usually controlled by the software running on the PC.

Anne told her mother that she was the one looking for the poodle. Her mother found it amazing that her 13 year old learned the TC before she did. Randy said that, if they had the Television Computer*, the poodle finder might have shown a picture of the puppies.

Marilyn said, "I knew that the TC knew where you lived, but I was amazed that it knew the problem with our water and that the puppy was within 10 miles of us. I think people know too much about us."

"No, Mom," Randy Jr. said. "It is TC itself that decides whether a message is worth posting to us. Nobody knows whether we get it, or even want to get it. Except the water alert that everybody received downstream from the water main break."

"By the way, is the water still bad?" Randy asked.

"No, the alert was cancelled this afternoon." Marilyn replied. "I discarded the messages."

4 Input Global Position:

A Television Computer needs a few things programmed into it. Like a VCR will complain by flashing a light until the viewer provides the time and date, the Television Computer awaits information by flashing its data channel indicator. But, unlike the VCR, the Television Computer knows the time and date within a short time of being plugged into the cable. It does not need time and date information from its owner. What it requires is the latitude, longitude, and altitude of the TV. Most people get this information from commonly available maps. Latitude and longitude are given directly in degrees, minutes, and seconds. The "Set Global Position" menu obtained through the PROG button is seen here:

```
Enter
        o        ,
__ __      __ __  __ __ . __ "
           Latitude
        o        ,
__ __      __ __  __ __ . __ "
           Longitude
        __ __ __ __ __ FEET
           Altitude
```

The display changes to "Latitude Minutes," then "Seconds," then "Longitude Degrees," etc., as these numbers are entered. The 'ready for input' underscore flashes.

For example, my television in Pittsburgh Pennsylvania is $80^o05'05.0"$ longitude and $40^o28'15.3"$ latitude with an altitude of 815 feet. Topographical maps give altitude as well as latitude and longitude. One second of latitude is 100 feet. One second longitude represents different physical distances on different places on the globe but a representative figure is about forty feet. To get the location accurate to about four to ten feet, "seconds" are given with a fractional tenth of a second. With the latitude and longitude for a house, the owner can add "seconds" east to west for longitude adjustments and "seconds" north to south for latitude adjustments. The count is downwards for longitude if the TV is in Europe or Asia and upwards for latitute if the TV is below the Equator.

Some apps are available that take input of street address and then compute the latitude, longitude, and altitude. The popular PC program "AutoMap" has provided exact global position information for PC owners since 1990. We have heard of "900" number telephone services that will give latitude, longitude, and altitude based on phone number. If the Television Computer is in a multistory building altitude estimates are based on the rule of twelve feet per story. Unlike time and date codes on VCRs, a

typical Television Computer will remember its position. It is possible to see what a Television Computer would "think like" if it were somewhere else in the data channel broadcast area by giving it an alternate global position.

Even if the Television Computer lacks its global position, it works. Turn on a Television Computer connected to a cable input and the small data channel indicator (to the left of the larger tuning channel indicator) should show that it is receiving the broadcast data channel. The Television Computer "knows" how to find the base data channel without assistance and locks onto it.

The INFO Button

The INFO button causes the Television Computer to display its posted INFO listings. This is the set of messages that are awaiting the attention of the viewer. In the example below, there is a listing by someone looking for a baby-sitter, and there is the program listing as provided by the app "Program Listing Plus." There is a similar app listing, but this is not to be confused with loading an app. The app "App Listing Plus" does provide the ability to cause an app to be automatically loaded. It also provides detailed descriptions of different apps as well as Plus, Inc.'s opinions and recommendations. The Microsoft Agenda App also has a message waiting to be read.

```
      INFO   Page 1 of 2

Press 1 2 3 or 4
    1 Find a Babysitter
    2 Program Listing Plus
    3 App Listing Plus
    4 Microsoft Agenda

Press >> for Next Page

Press ENTER for statistics

        Press PROG to exit
```

```
      INFO   Page 2 of 2

Press 1 2 or 3

     1 City Events
     2 Anne's Homework
     3 Travel Alert

Press >> for Next Page
Press << for Previous Page


        Press PROG to exit
```

On page two of the info is info from the app "City Events," and info from Anne's Homework app, (an app written by Marilyn that detected that Anne's teacher has published a message). There is a travel alert posted by the app "Travel Alert."

Marilyn got the idea to name her house so that people could broadcast to her. She wanted to establish a social concern group interested in the environment of the lake. She would broadcast a notice around the lake. As she got people to answer, they would give her their TC names and they could stay abreast of any actions that threaten the environmental condition of the lake area. There were going to be no more secrets. She figured her cost at about $30 a month and each group member would pay her $1. She

would not tell Randy that she was orchestrating this.

Press ENTER for STATISTICS. The statistics panel brings up the basic statistics about this particular Television Computer:

Statistics

Serial Number 54B987DA

Date January 23 1996
Time 4 : 50 PM
Special Name WINTER PALACE

Memory Available 125,000 Bytes
Last Backup January 13 1998
Last Shutdown 9-3-1997 04:03:26

Press PROG to exit

The special name was requested from the cable company and broadcast to the TC so that the household could give the TC a name.

The APPS Button

Six months later Randy had three TCs and a brand new TC-TV for the family room. The salesman had told him that having different TCs for different TVs lets the family share more easily. His teenage son, Randy Jr., had a TC attached to his PC for application and info development. They already had a better app for getting at local stores and restaurants. They were thinking about trying to sell it or submit it to a publisher.

His wife, Marilyn, had her own TC on their bedroom TV. Randy did not know what she was doing with it, but he knew she used it to make two hundred dollars last month. The TV in the basement had his private TC on it. He could look for better places to live in the area by setting the global position to different places and check the maps. He even found out about eating places around his office and private meeting rooms that could be rented. It was amazing to him how the TC had increased space utilization in buildings and homes in the area -- simply because people could

readily access the data without being swamped in it. It was this that caught Randy up in the TC: for the first time he had natural, easy control over what information he received and when he received it. The TC-TV in the family room was bought because he could guarantee that his elementary school kids would never see any hard violence. In fact, they had only six channels to pick from. "The CNN Good Viewer was the best automatic television scheduler available," he thought.

The APPS button provides a listing of the apps that are currently on the execution stack. These are loaded in memory, and, if any or all are awake, are monitoring for broadcast info or doing some other TC tasks. An app can be put to sleep by selecting it and then selecting the command to put it to sleep. This is a way of keeping apps around without discarding them. Note by the "*" the apps that require the graphics version of the Television Computer. With the Television Computer*, and a graphics window manager app running, the viewer would see this same listing in the form of a graphics window. Microsoft introduced Windows NT on the TC to serve this need for graphical user interfaces.

```
APPS    Page 1 of 2

Press 1 2 3  4 or 5

1    Find a Babysitter
2  *  Travel Alert
3  * Find a Carpenter Plus - Asleep
4    Microsoft Agenda
5    City Events


Press >> for Next Page
        Press PROG to exit
```

Additional pages are similar to those for INFO. The panels that follow the selection of any of these apps, like panels that follow the selection of any of the info messages, are under control of the apps. However, one app panel looks like this:

```
CITY EVENTS
Press 1 2 3  4 or 5

1  Find by Times
2  Find by Keyword
3  List Today's Events
4  List Weekend's Events
5  List Government Events

Press ENTER for Copyright.
        Press PROG to exit
```

The app "CITY EVENTS" is provided by an application entrepreneur who franchised info entrepreneurs in cities across the country. These are part time, extra income, jobs for almost a thousand people.

Randy and his son went to Brookside Mall to look at golfing gear. They went into Service Merchandise just to see the going prices on golf sets. On their way in, they wandered through the

television department.

There were flat televisions that you could hang on your wall. One of these had an associated end table with a built in VCR/TC that communicated to the display by way of infrared remotes. The TV could display up to three live channels and had flat panel speakers built into either side of it. It was big and beautiful. It was also six thousand dollars.

Randy Jr. explained that he liked TCs built into VCRs because that meant that the VCR would know the time and date and that TC data storage was easy. Furthermore, with a VCR/TC you get an app that uses the VCR to compress programming. Every night you can watch the shows for the last day or so that you wanted to watch. "Better than what they broadcast as TV on demand," Randy Jr. said.

They looked at some pure VCR TCs and some pure TC TVs. Randy Jr., completely out of the blue, said, "You know all this stuff is outlawed in Saudi Arabia."

"I heard it was Iraq and Iran," his father was being kind.

"I think most of the Mid East." Randy Jr. said that he read a story on the American cable operator, Glenn Williams, that took the first contract to install a Television Computer head end in Saudi Arabia. "The government had figured that since information comes down and not back up, it would be pretty easy to control. Unfortunately, almost immediately, the info entrepreneurs and the app entrepreneurs started conspiring to get information in the privacy of homes. As fast as services were shut down, new ones began."

"That's a real joke! They actually think this cable guy Glenn Williams was somehow responsible for usurping their authority. Anybody knows you can't stop an Arab when there is a livelihood to be made," said his father.

"Yes, but the government cracked down, made the TC illegal,

and sent Glenn Williams, and his cable company back to the states. I read that Glenn Williams now has to maintain security against those who regard his Television Computer as an evil machine."

Randy did not bother to say that the Television Computer was not 'his.' "Son, I like this TC TV here," said Randy pointing to a 26 inch tube model. "Let's go and look at that golf stuff."

Similarity to VCRs.

The Television Computer is intentionally similar to the VCR. Normally, the stand alone Television Computer can tune channels like a VCR and the menus are similar to common VCR menus. If the TV/TC switch is on, the TC will produce video on channel 3 or 4 or on its video (RCA jack) output. If the switch is off, the TC will simply pass the cable signal unmodified. The stand alone Television Computer has a built in speaker that it uses for signalling if it needs attention, even if the TV set is turned off. This speaker may be used for emergency warnings (in the case of floods, hurricanes, and the like). The Television Computer built into the TV uses the TV speaker. Indeed, built into the TV, it can automatically change channels and turn up the volume when there is a civil emergency message.

The universal remote control unit provided by some Television Computers is a "Learning Remote" that can learn the remote control codes for most TVs, VCRs, and cable tuners. Unlike the VCR model, however, is the capability of the Television Computer, itself, to learn and drive the remote control of other devices, like VCRs and TVs. Indeed, a popular app, The VCR App, can run several VCRs based on TV program schedule information. With this people can "compress" TV programs to the ones they want to watch, when they want to watch them, automatically adjust TVs, and even signal between different TCs in the same room.

There are expensive Television Computers available with hard disks, Fluent store-and-forward (a video programming digital

storage capability licensed from Fluent Machines, Inc. of Natick Massachusetts), and high resolution graphics. These are offered as hybrid TC personal computers, or, so called, TC PCs. But the simple basic TC model includes optional digital interface attachments for telephone data modems (for pay-TV applications), and a variety of other "plug ins" such as printers, infrared keyboards, infrared remote control devices, and PCs. These are manufactured following the interface specifications and cables supplied by Television Computer, Inc.

The **APPS** and the **INFO** Buttons are unique to the Television Computer. A viewer can press either button at any time and will get a predictable response. **INFO** will bring up a list of messages that have been posted by an app. The messages are the TC's way of communicating statements to the viewer. A common message is the one that indicates that a particular sought for app has been found, loaded, and started up as in "Local Announcements App" - "App is Loaded and Running." The **APPS** button provides the list of apps that are currently loaded.

An early common confusion was that the **INFO** button provided all the info. It does not. For example, the Dow Jones App only occasionally posts specific info to the **INFO** Button bulletin board even though that app is in constant receipt of new information. The methods for "digging into a database" are owned by an app (or accessible through one). The viewer must use the **APPS** Button, select the app, and run the app's built in database search functions. TCs are not designed to provide large on-line databases even though they can hold one or two fairly sizable ones. CDs are common, along with PCs, for large static databases. Nevertheless, there are various "marriages" of the two technologies that use TCs attached to PCs for providing database updates to static CD applications.

Vladimir looked like an American and spoke English like an American. Lian Fong knew that to control him she could rely on his desire to get back to Russia with his family. The Chinese had kept him hostage after the fall of communism in Russia first by playing on his KGB ties. He had been an industrial spy for the

KGB. Then, when it was clear he could go back to Russia, they kept his family hostage by simply denying exit visas. His wife was Chinese.

"If you complete this work to our benefit," she said, "I can promise that China will permit your family to emigrate to your Russia. The motherland will ask no more of you." Lian was pretty confident she was telling the truth. Since he had only worked in these commercial investigations, Peking had no problems with granting his wish to emigrate. He was a Russian and could not be trusted for critical security work. With the changes of the last few years, there was less industrial espionage of interest. The ministries were tilting their interests more toward the preservation of communism and their own jobs.

Her instructions, directly from Peking, were to put together the team to examine what use the motherland should make of this Television Computer. Their experience with TV had been acceptable. They understood immediately the value to the peoples education. They needed an in depth analysis of this American Television Computer phenomenon. She had figured out the basic product line.

"We want our scouting team to appear to be made up entirely of ethnic Americans. We need to know what the Americans will say to themselves about the Television Computer. But we need to know this through our eyes."

"I understand," muttered Vladimir, in flawless Chinese.

She continued with Vladimir, "We need a study done that only you can do. You are our agent, but we have arranged two American support people to meet you in Los Angeles. Their names are Randy Thompson and Nello Friedman."

Her pronunciation of their names was atrocious, but Vladimir figured he did not have to ask her to speak more carefully. He was right.

"Since the work is principally open, and not black, there is no safety problem. They are to believe you are American. This packet has your American identity papers and the written briefing.

All we need you to do is study this Television Computer industry in America and provide a working report on how we might advance the peoples communism with it. Pay particular attention to how we might educate and enlighten. We need to know how to introduce the Television Computer under central planning."

She handed Vladimir a published report on the physical products that make up the Television Computer.

"Take this. We know that The Television Computer Channel needed these physical elements in order to operate. We can put this stuff together with our technology. In fact, the Americans want us to bid on building Television Computers for them."

TC Physical Products

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┌─────────────────────────────────────┐
│          Basic Product Line          │
│   ┌───────────────────────────────┐  │
│   │      Television Computer       │  │
│   └───────────────────────────────┘  │
│   ┌───────────────────────────────┐  │
│   │        Software Toolkits       │  │
│   └───────────────────────────────┘  │
│   ┌───────────────────────────────┐  │
│   │  The Television Computer Book  │  │
│   └───────────────────────────────┘  │
│   ┌───────────────────────────────┐  │
│   │    TVC Broadcast Workstation   │  │
│   └───────────────────────────────┘  │
└─────────────────────────────────────┘
```
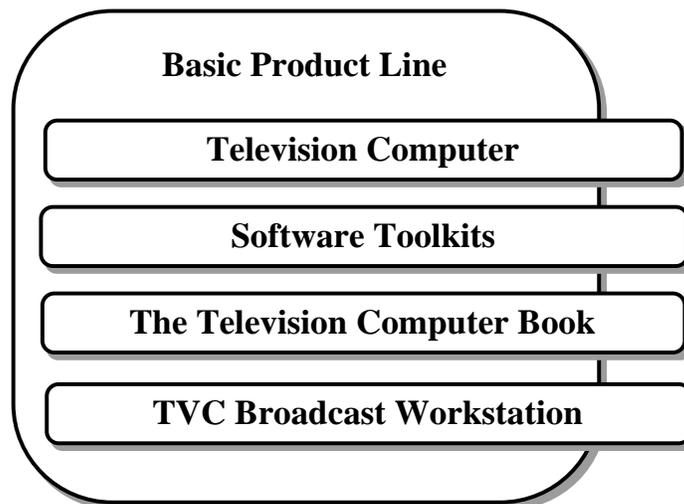
In addition to the Television Computer in different varieties and the various digital attachments, the digital interface allows the computer to be connected to any PC. Software Toolkits are offered, including PC to Television Computer cables, that allow any person to write a television application that can run on any Television Computer.   In 1992, this book was written to get this message out.

A computer workstation is also available, called a "Television Computer Head End," that allows a cable broadcaster to create his own broadcast data channel. On his workstation, he simply drags an app or info package into a send window and indicates the desired broadcast times. This workstation contains special circuits that test and assure the validity and integrity of any app or info that may be broadcast.   For small cable operators, it contains the necessary software for operating a publishing service.   This little chart should help those people who are not familiar with the organization of broadcasters and cable operators in the United States:
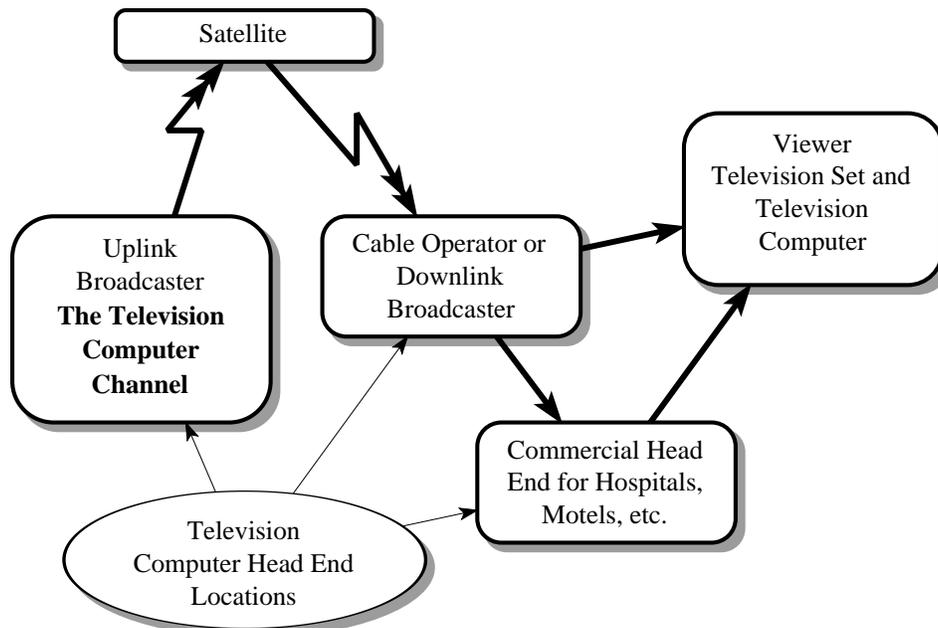
Randy got the phone call that evening at 8. Again his Chinese contacts from his college days were paying off with business for him. The Chinese Chamber of Commerce had signed the contract to develop Television Computer business opportunities in China. He had orchestrated several market research tours for the Chinese before.

His job was to aid a couple of American consultants in visiting the key facilities for the Television Computer throughout the U.S. They would then write a paper that would be the basis for a high level Chinese delegation who would work licenses and develop the actual business. In particular, they wanted to understand how Americans were using the Television Computer. The Chinese delegation wanted to be well briefed by this American advance team.

Randy had two weeks to arrange meetings in the U.S. His plan had been approved with the contract. He now had to make all the arrangements. His first order of business was to contact the other members of the advance team. This would be the economist Nello Friedman and the New York market analyst, Vernon Jankins. He only had a fax number for Vernon, but that was OK. Randy had arranged several of these international business tours before.

"Can you check the info panel in the family room?" called in Marilyn. "I want to know if the TC found the TupperWare person."

"Sure. No." Randy clicked the INFO button and clicked it back again. The action was effortless and within ten minutes Randy will have forgotten doing it. He had given up trying to talk Marilyn out of buying TupperWare.

Why so Simple a System?

The Television Computer is, as computer systems go, an extremely simple system. At the time that the Television Computer was being envisioned, FROX, Inc., was created. FROX

implemented a similar concept but for the high-end user with typical system prices exceeding $10,000. The low-end system has the advantage that it will run on any TV. But more important, the design of the Television Computer is to enable a large number of people to be involved in the broadcast media. The closed FROX system did not allow this.

A second important simplification is the lack of reliance on interactive services. While every Television Computer is capable of accepting viewer input, and many are capable of making a phone call or connecting to the cable system interactive system, the need for tight interactive services was found to be greatly overestimated in the 1980s and early 1990s. This topic is taken up in the name of the "Coryn Principle," in the next chapter.

"The weather in Las Vegas changes less than the weather in L.A." Randy's mind was wandering off now. He looked back up to the podium where Glenn Williams was closing his speech.

"So now I think your widgets and wadgets, your hardware and software, are neat, as long as I don't have to see them or understand them. You probably think I am a pretty scared puppy to bark so loud, but I have authorized that my foundation fund a contest and COMDEX will be the place where winners are announced. When you leave tonight you can pick up the rules. Each year there will be a Robot of the Year award.   The winner gets $100,000. Not much nowadays, but this is something for all you computer buffs." Glenn was being himself.

"The award will be given to the robot that helps an average joe the most without making him learn or do anything. I suggest you use TCs and cable, but you are free to do what you want."

Randy had no reaction to this. He was not a computer person either. Randy would spend the night in Las Vegas and head back home to L.A. the next morning for the first meetings with the China advance planning team.

Chapter 2
A New Economy

Nello tried to explain to the other economists that worldwide manufacturing capacity far exceeded demand. The problem was that traditional economic measures did not adequately reflect the combining effects of the breakdowns of trade barriers with the hundreds of countries tremoring to move out of the Third World. Quality goods were assumed by customers and almost always delivered by the manufacturers. Yet manufacturing was no longer the cash mechanism dominant in the 20th Century. The 21st Century was truly going to be the Century of the Communication Revolution. "The Right Information to the Right Place, On Time" was the motto of one of the new start up companies.

"This is an information company with researchers worldwide. They use the Television Computer as the means of delivery."

The meeting in the L.A. Economists Club was over and Nello went to his office to prepare for his meeting the next morning with Vernon Jankins.

A new economy has appeared around the Television Computer with a potential to grow to a noticeable percentage of the gross national product. This is taking place because people use Television Computers. People find them a source of wealth and a way to control the information onslaught.

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┌─────────────────────────────────────┐
│      Television Computer, Inc.       │
├─────────────────────────────────────┤
│               Mission               │
│                                     │
│   To successfully deploy the first robot │
│   servants through efficient utilization │
│     of cable television infrastructure.  │
└─────────────────────────────────────┘
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Television Computers take away many problems with television. Increasingly, Television had become an addiction, perhaps no less dangerous than the opium addictions of 19th century China. Providing viewers with choice only fed the addiction without providing commensurate personal opportunities. Too much TV was being shown to too many people. Nobody wanted control from the cable companies or the Government, but it had to come from somewhere. Now, for example, parents can know there is somebody who lives nearby who provides like-minded censorship of TV as a five dollar per month service. Indeed at least some cases of "Television Diets" have appeared that edit commercials and program fare downwards simply to wean people of the "television habit." The Television Computer has enabled TV participation for profit by millions of people.

The scale of this new economy is enormous and the economy appears to be self-sustaining. What brought this about is a brown box. The economic seeds of change occurred because that brown box was introduced along with an open architecture for apps and info. The philosophy of Television Computer Inc., was, from its inception, "enfranchise, don't disenfranchise, and keep it simple." This paralleled Ted Turner's, "Lead, Follow, or Get Out of the Way." Television Computer Inc., chose none of the above.

Vladimir arrived at the Marriott and checked in under his new name, Vernon Jankins. He was to meet the Americans there the next morning. The TV monitor in the lobby indicated that the restaurant was to the left. He noticed the one in the hallway

indicated the restaurant was just to the right. "Those are TC TVs," he thought.

Why Television Computers? - The Coryn Principle

People buy Television Computers for a number of reasons, but mainly because Television Computers make televisions more reasonable. Unlike TVs, VCRs, and video games, TCs provide **a** ready opportunity to make money and save time, hassle, and effort in day-to-day living. Of course, Television Computers can be fun and entertaining. Disney and Worlds of Wonder introduced animatronics into the home through the digital port on the Television Computer. Unlike previous products, like the old Teddy Ruxpin, the new Teddy Ruxpin has a new story to tell every day.

The Television Computer was designed to follow the *Coryn Principle.* This principle is named after Stan Coryn, a Warner Communications, Inc., executive, who observed that people buy television devices that don't require active thought or effort. Indeed, the Television Computer, besides providing a source of additional income to tens of thousands of people, provides its services without asking. This does not negate choice. A person selects a service like he selects a television program. But only the Television Computer "watches the service." A service teaches the Television Computer how to be helpful in a certain way. Once taught a new thing, the Television Computer will do that thing unless it is powered off for several days, or it is told explicitly to stop doing it.

The application or app is the same kind of thing on a TC as a computer program on a PC, and provides the mechanism for teaching the Television Computer how to do new things. The Television Computer Programming Languages that are available through computer software distributors, such as TV Basic, TV C++, TV ICON, allow the Television Computer to run any application imaginable. This makes the TC like a PC. The Television Computer is as versatile as any computer.

However, unlike many PCs, the Television Computer can run any number of applications seemingly at once. This multi-tasking capability is an important attribute. One Television Computer can do the work of countless special purpose devices.

This is an attribute of the operating system that runs on the Television Computer. The operating system, like any app, is simply a computer program running on the TC hardware. The operating system combines an "app manager" for multi-tasking, a file, or data, system called a "persistent object store," and control of system resources, like the infrared controls or telephone modem. As new features to the operating system are created, these are broadcast to all Television Computers by Television Computer, Inc.

The Television Computer assumes there is at least one broadcast data channel it can tune. That data channel is its basic connection to the world. Like regular TVs are connected to the broadcaster, not to the people in the household or office, the Television Computer is connected to the system broadcaster. In the world of computers, this means that the Television Computer is a "local area network (LAN) receiver."

Finally, while all Television Computers provide facilities through attachments for "Interactive Cable," Television Computers cannot communicate back to the cable broadcaster or to anybody or anything else without clearly showing the "I-" on the display. No basic Television Computer is a "big brother watching you."

Where Nintendos go into the play room, and smart VCRs go in the living room, TCs tended initially to be bought for the family room but many quickly migrated to the master bedroom. That way, in an emergency, the family could be awakened. TCs still dominate in office and family room of course.

Nello went over the documents that Randy had sent him. Vernon had the task of writing the report for the Chinese, and Vernon was to be in charge. Nello's job was the economic analysis.

This guy Randy Thompson was to organize visits and travel.

The injection of Television Computers into an economy the size of China was interesting. There were questions of infrastructure having to do with matters like the number and distribution of television sets, the reliability of broadcast, and the reliability of electrical power. He would have a lot to talk to Vernon about if Vernon was taking responsibility for writing the white paper. "In particular," he thought, "I have to talk to Vernon about alternatives to the Television Computer. Seeing the alternatives gives a good view of the fit."

The Alternatives

The TC was introduced in the marketplace in a context of other devices introduced about the same time. These devices were designed for entertainment, immediacy of interaction, or simply as exploitations of technology. By the end of the 1980's, it had become apparent to many businessmen that the means to riches in photography, namely film developing, had been replaced by the means to riches in information, namely the transmission line. The break up of the telephone company was a coupling of greed and progress that emerged from the recognition that owning the medium of information transmission was as lucrative as owning the information itself. A large number of devices were introduced that capitalized against the installation and maintenance of new transmission lines. The company TVAnswer used special radio transmissions like the TC uses the telephone. The TC was one of the few devices that required no modifications to the existing interconnect technology.

There have been many attempts to provide digital services into homes. Given the success of the Television Computer we can, retrospectively, look at what went on with other approaches.

The IBM PC (Atari, Commodore, etc.) There are personal computers in a large number of homes today, so it is hard to say that these have not been successful, unless, of course, one asks companies who have vied for the market. Personal computers fail

to embrace the Coryn Principle and fail to provide entertainment. When people sit down with the personal computer, they see work. This is not something that they think fondly about unless they are among the fortunate few who make money from the PC. The TC provides a larger "programming" and thereby "money making" audience, since people can be info entrepreneurs even if they are not knowledgeable enough to be app entrepreneurs. The TC aids, if it does not exactly provide, entertainment. The fact that every TC readily interfaces to a PC, and thereby makes the home investment in the PC valuable in a Coryn Principle sense, is no small part of the puzzle about why TCs are well accepted.. The operating system on every TC provides computer virus protection. The TC cannot go interactive without signalling and being given permission, and no application can influence another unless specifically authorized.

Prodigy/CompuServe. These services are provided as a means by which personal computers become more useful since they provide a means by which people may interact with each other through their personal computers. The big brother effect hit in 1991 when the newspapers carried stories about how Prodigy was downloading programs into people's PCs without their knowledge that inspected the PCs contents and reported this back to Prodigy. This sort of "commercial virus" had a pretty negative effect. However, the real problem with these services is that they are at odds with the Coryn Principle: the person using the service is constantly working to figure out what to do next to get the next thing to happen.

Teletext. This was an early attempt at something like the TC. It was a clear business failure by 1985. This was partly because of the cost of the home box ($900), and partly because it was a scrolling text service only. However, with Teletext you could do very TC-like things, such as requesting on a continuous basis information on a particular topic. A more successful system has been the French **Minitel**. However, this uses the phone lines and, compared to the TC, is primitive. Among the more insightful aspects of Minitel has been the percentage of pornography that gets ordered up through it. Even though it

uses the phone lines, its interactive use is extremely limited. People feel safe with it, like they do the TC.

X*Press. This is a publishing service carried by TCI (the cable company). It provides text news services. The owners of X*Press like it because they find out things that are generally only known by the purveyors of the news. However, X*Press did not catch on because there are generally not many people who want to know this much detail about world news and events. Furthermore X*Press did not let other companies write information service apps for the X*Press channel. X*Press is now available through the X*Press App on the TC.

Digital Audio/General Instruments - **Jerrold, Digital Planet.** The bandwidth of broadcast is such that digital audio sound broadcast is technically straightforward. Jerrold introduced a box, similar in appearance to the TC, that provides digital audio output jacks for a home stereo system. For audiophiles this system has met with some success, although the more inclusive FROX system is also available to the serious audiophile. Like X*Press, this system does not allow the downloading of apps by broadcast -- in effect it is a "dumb box."

PBS. The Public Broadcasting System began pumping out digital data on certain horizontal retrace lines of its broadcast channels and selling the digital channel access. This was one of the real precursors to the TC in actual use, although it was piggy backed through an existing channel as an added revenue device. In one of the major uses, cable TV would be connected to VISA charge card verifier boxes. Broadcast to these boxes was the charge card numbers of cards that would not be approved for credit (detected as stolen, etc.). Such verifiers needed no costly connection to telephone services.

Qube. The Qube, an experiment of TCI (the cable company), is an example of a system that people did not feel safe with. It was an experiment in "interactive cable." By taking a small part of the cable bandwidth and setting that aside for "upstream traffic" and then by putting in polling processors that watch for

"upstream input," it is possible to achieve two-way cable. Now, this is nothing really like what the telephone company achieves in its "point-to-point" system of connections. Cable achieves a "point-to-multipoint" broadcast and a "point-to-central-point" return. Telephone companies achieve larger "aggregate bandwidth" than the cable companies although the cable companies achieve larger "individual home bandwidth." The Qube System gave interactive boxes, again dumb boxes, to home viewers who could vote or otherwise interact with broadcast television. The problem is that people did not want to do things like that. This, again, was a violation of the Coryn Principle. Furthermore, there was that gnawing problem that if the Qube box could know your opinions, who was watching?

Insight. Insight was a TV Scheduler that presented TV Schedule listings by time and topic and allowed people to select TV programs to watch or record. The Insight App is now one of the most popular TV Schedulers on the Television Computer.

Pay-per-view. Pay-per-view charges a show to a credit card. This is an economic transaction that is integrated with the TC since each TC has a unique ID and some TCs function as a cable decoder box. There are many apps and info streams that are themselves pay-per-view. A person desiring any of these, such as the Dow Jones Info App, calls in his request and puts it on his credit card.

HSN (Home Shopping Network). This was an early pre-cursor to the Television Computer Network. On a video channel, salesmen sold their wares. HSN still exists but now uses Television Computer applications to multiply the number of products offered and to gain a much larger throughput. Now the video channel salesmen can afford to be more polite since they know that the critical "going, going, gone" stuff was going to appear at the bottom of the screen -- suited to the particular needs of HSN.

PCN (Personal Communication Networks). This involves

the use of micro-cellular radio. The idea is that there is a cable connection to a TV box that, itself, forms a short range radio interaction. Handheld units and cable-free in-house, communications could then be achieved. Since this does not replace the existing TV medium, it properly augments it. Furthermore, it can bring up the aggregate bandwidth of the cable system enormously (in the same fashion as tiered switching does this for telephony). Although PCNs were designed for digital telephones, PCN TCs are now appearing that demonstrate the compatibility of the two concepts.

TVAnswer. TVAnswer was a low bandwidth interactive service provided through cellular telephone type arrangements. It was partially positive in that it provided for the downloading of functionality provided by the corporation and it overcame the limitations of interactive cable through the tried and true cellular telephone concept. The real problem with TVAnswer is that it created still another medium -- cellular digital transmissions -- when cable and telephony were effectively under-utilized as the TC demonstrated. However, TVAnswer stood out as a well backed venture that demonstrated considerable business sense.

FROX. This high end system was mentioned earlier because, in a limited sense, the TC is its low-end equivalent. However the FROX system differed in some ways besides the cost/performance dimension. Because the FROX system did not provide a high bandwidth data channel, but rather a single horizontal retrace line ("FROXCAST"), it could not behave as a high bandwidth info/app gatherer. Furthermore, and more importantly, FROX writes the applications. Mere mortals cannot participate in FROXCAST.

Videoway. This Canadian system comes close to the Television Computer. A listing of TV services and Data Services gives the idea: channel number and station ID, volume control, time and date, pay-TV and movie multiplexing, pay-per-view interactive, captioning, teletext, interactive television, multimedia audio/video catalogues, database access (including Minitel in French), video game application software, home

automation, home banking, electronic mail services, semi-local advertising, and home shopping. Like FROX, mere mortals cannot participate in producing competitive products on videoway boxes.

Skypix. This was the "Videoway" and "TVAnswer" of the direct broadcast satellite (**DBS**) crowd. It went bankrupt as a start up failure. Later replacements included the Hughes experiment.

A summary of capabilities such as the ones below suggest the advantage of the TC, but the real advantage is that the TC is not limited in its capabilities by the prowess, or marketing analysis, of a single company. Apps and info entrepreneurs made the TC successful. "Public Programmability" that supports app entrepreneurs works, like it did with the PC.

	Supports App Entrepreneurs	TV Schedule Viewer	Pay-per-View	Parental Control	Automatic Scheduling	Viewer Messages	Channel Coordination	Latitude/Longitude/Altitude	Local Ad Insertion	Super Local Ad Insertion	Map Directions from Home	Worldwide News on Demand	Dow Jones Information	Emergency Alerts	Exact Time of Day and Date	Candidate Platforms	Local Store Sales	Animatronics Story Tellers	Infrared Control of Other Devices	Download to PC	Cable Interactive
Television Computer	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Scientific Atlanta Terminal		●	●	●		●		●						●							●
X*Press		●										●	●		●					●	
Teletext/Minitel		●							●			●	●								
Insight		●	●		●											●					
Videoway		●			●	●	●									●	●				●
TV Answer		●	●		●	●								●			●				
Frox with Froxcast		●	●		●	●								●		●			●		
Prodigy/Compuserve												●	●								
Personal Computers	●																				

Vernon was waiting at the Marriott restaurant and Randy showed up first. They decided to wait for Nello before ordering.

They traded business cards. Randy wondered who Vernon's printer was. His business card as a Market Research Specialist for Meyer and Meyer in New York City was pretty crummy. Even Randy, as President of his own one person firm, had much nicer cards from Copyboy. Considering the people that these guys wanted to meet, Randy thought he might suggest redoing the business cards. But he was silent.

Randy and Vernon were exchanging stories about their families before Nello arrived. When Vernon told Randy that he did not have any TCs at home, Randy said, "Gee, I thought I was the last convert in North America. I have four now."

He thought for a few more seconds, then continued, "Why do they have you, of all people, leading this team? You don't even know why people buy these things?"

"Maybe that's why. " Vernon replied, "I am pretty objective and thorough, and I have to figure out how this stuff might fit in China. That's a pretty different place from the good old U.S.A."

Nello walked up. "Is this the Chinese study group? Ya'll don't look Chinese to me!"

Vernon and Randy stood up smiling. They shook hands and sat down.

Nello said, "I am really interested in this. It represents a once in a lifetime opportunity if China goes ahead with installing Television Computers and I can test my predictions. An entire economic system gets formed around Television Computers."

"You mean people pay for the Television Computer service, right?" Vernon interjected.

Randy jumped in, "No, a lot more than that." He gave an example, "I know this situation in St. Louis where an app entrepreneur published an app. He paid the $100 to have his app broadcast, and he paid the $25 to have the App Listing Service

register his app in the New App listings. The app had people call the 900 number processing bureau with restaurant recommendations. For their participation, they would receive the restaurant ranking statistics. The app entrepreneur is also the info entrepreneur here, but this is a pretty complete economic system set up by one guy. This guy still makes a ton of money, but it looks like the cable operators are starting to compete with him directly for that money."

"Randy is approximately correct, but you have to find the means to study the economies collectively," Nello said. "What is neat is that this guy in St. Louis, I think his name is Samuel Campbell, figured out the infomation that people would pay a couple of bucks to have and a couple of bucks on an occasional basis to keep current. Multiplied by a base of 10,000 subscribers for each $125, Samuel could make money."

"By the way," Randy said, "you would think the Chinese would send spies in to do our job." "Neither of you are spies, are you?"

"No." "Nope." Replied the two.

Vladimir thought to himself in Russian, "If I can just get my family back to Russia! Those Chinese dogs! In Russia Ted Turner made the Television Computer work for democracy and capitalist rehabilitation. I know what the Chinese communists want to do. They probably want guys like Nello to run things."

How is money made?

The 1992 economy in cable television is explained by the diagram below. It contains arrows that show the direction of money flow for the goods or services rendered.
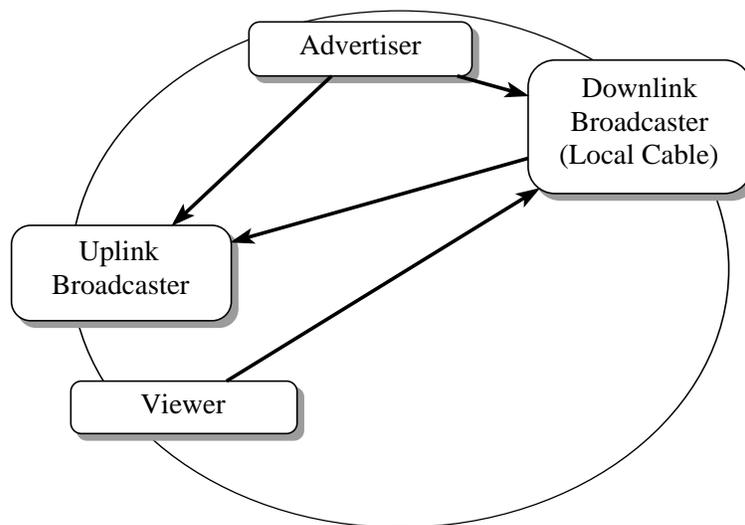
The Television Computer adds info and app entrepreneurs to the previously existing mix. The previously existing mix included uplink broadcasters like Turner Broadcasting who were paid for programming, cable operators (downlink broadcasters) who were paid by the viewer, advertisers who paid both uplink and downlink systems for cable program time, and the government, that was usually granted service time. In the previous economic system there were only four arrows ignoring government contributions.   Now there are eleven ignoring government participation again. This is a stark way to show the economic impact of the Television Computer.
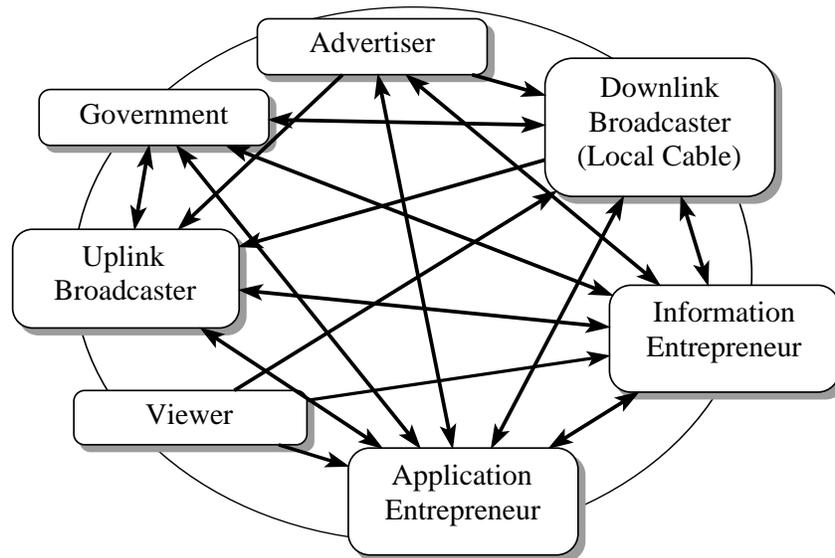
But, besides making a new market for computer software and computer information, there are additional economies of scale. This is because the Television Computer has a direct impact on the size of the participating communities. In the most stark example, the advertising community has grown from a few thousand advertisers to millions of advertisers. The Television Computer makes possible the $5 Micro-Ad. It enables households to, for example, advertise for baby-sitters using television.

The reason this is possible, and the reason for the interest from the local cable broadcasters, is seen by analysis of the money per day transacted on $5 Micro-Ads through *one* data channel. Assuming that one ad is limited to 50 words (500 characters), over 4 million ads can be run per day. Multiplied out for 24 hour's worth of ads (since the Television Computer can trap the ads of interest to the household no matter when they "play"), the value of the data channel is $20,000,000 per day. If only 10% of the Micro-Ad bandwidth is available for super-local (cheap) ads, this still has a value of $2,000,000 per day, 365 days a year for the local cable operator. With a potential revenue of $730,000,000 per year on $5 Micro-Ads that still use only 10% of the practical capacity of one channel, the local cable operators get wholeheartedly behind the Television Computer.

Micro-Ads, when properly promoted, are the single largest revenue source for the local cable operators. Newspaper classified ad departments have been greatly expanded to handle the local cable company requirements. Television Computers greatly reduced the local cable companies' need to increase monthly subscriber charges.

It is this massive time compression of useful messages that makes Television Computers a powerful money generator for the TV owner, too. A carpenter can afford to place ads for his services in a small geographic area that only people interested in getting a carpenter will see.

Indeed, while there is a great increase in the number of advertisers in Television Computer communities, there is another, less obvious quantitative increase in economic participation. For example, there is an increase in government participation. Governments are charged with the safety of the community. They, too, pay to get messages out. But now, like the carpenter, they can get messages out to precisely the right people. Therefore, the government generates many more messages. The Emergency Broadcast System, EBS, set up by the U.S. Government decades ago, now has sources of income from local governments. We are familiar nowadays with the reminders sent out around neighborhoods for town and school meetings. A reminder costs $5. The government alert, giving an instant warning in a small locale, costs the government $100.

Nello liked these two guys, Randy and Vernon. They were both intelligent, and clearly he understood the world in different terms from them. He asked Randy, "What are you setting us up to do?"

"Well, I have basically arranged a series of stops throughout the country. We have meetings a few days here in L.A. Then its up to Boston, down to Atlanta, and back to L.A. This should give us a pretty good overview in two weeks. We have a broad spectrum of TC business interests as well as some of the groups

that have negative things to say. We will meet Television Computer, Inc. in Atlanta. In Atlanta, they produce the Television Computer Channel."

Vernon said, "That looks good. Nello, you are going to meet with DataQuest for the standard market research information, right?"

"Yep."

"Just keep me filled up with literature. I need to review as much stuff as I can. Randy, in the follow up you might have the privilege of arranging the real Chinese business delegation. I think this scouting trip is going to work out fine." Vernon thought again. "I would like to recommend that one of you two take over the organizational effort after I do my job on the initial analysis.

Randy liked that idea. It was his business. "Well, this afternoon, we visit UCLA. This morning we tour a store or two with TC products."

They drove to Burbank to look at one of the computer superstores now specializing in TC as well as PC products. "Randy's idea of hitting a store as the first order of business was good." Thought Vernon. "This really gives a feeling for the scope of the TC."

"Here, lets buy this." Said Nello. It was a memory card for a TC with the store shopping app on it. Anywhere in L.A. and several other cities around the U.S., they could plug the card into a TC and the television would start letting them peruse current store offerings. The memory card cost $25, refundable against a purchase, and it sure made life easier.

"Let's buy three." Said Vernon. "We can study the store in more depth in the motel tonight. The Marriott has TC*'s in all the rooms. The card has a star on it. That means it shows pictures, right?"

"Right." Said Randy. He was thinking to himself that he just got a store catalog paid for by a business deal.

Television Computers have increased business opportunities. One of the real problems with the dominance of commercial electronics by foreign nationalities was their inability to innovate locally. Local means "by neighborhood" or even "nationally." The dynamic range of commercial electronics *innovation* is greatly increased. Even simple Television Computer functions, like the "find a carpenter" application, can be changed and improved. People may like "Smith's Premium Find a Carpenter Application" over the "Westinghouse Find a House Helper Application." The carpenters will know (because their clientele will tell them and they have Television Computers too!) and will pay to have their ad run on the best application. Of course, this is a relatively minor example, but it generalizes to every application including those supplied by the larger companies, for example, the "Microsoft Automatic Television Scheduler."

Another basis for new business has been in low cost, complex components, such as processors, used by the Television Computer. Previously television components were dominated strictly by those components that were strictly for television. Now that computer components are commercial electronic components, there are new drives toward competitiveness.

There is talk in Hollywood of producing the first Television Computer movies that incorporate a broadcast application. This allows a person (or a locally provided application) to indicate the violence level acceptable, the language spoken, even the depth of the message, and to have the movie automatically accommodate. Film editors and producers like the idea of being able to show alternate versions of movies, even if the directors are having some problems with that.

People make money all over the place with Television Computers. Another place is single person info services provided to remote localities: Info services in real estate now exist that query the services available at a particular house address by

simply accessing a Television Computer in a cable service area and keying in the global position of the house. This allows people to provide exact info on how far it is to local stores in the form of such useful data as "Where is the *nearest* grocery store? What store is it?"

There are people who just own a TV and watch it. Some people like to have several apps that return with data within a few minutes to a few days because the TV wakes up with interesting messages at random times. Some people, it seems, like to "play Television Computer." Since so many apps are free, this activity is free. The automatic real estate application, paid by National Multilist, Inc., automatically provides such info. People in the market for a house in a particular area are running this application, but so are people who just like to watch TV. There is constant change going on in the types of real estate applications, of course. What is good is that Television Computers are not inhibiting change, even radical change.

The money made with the Television Computer is created through goods and services delivered. Central to these goods and services are the killer applications discussed in the next chapter.

Chapter 3
Killer Applications

Professor James at UCLA explained that nearly every category of life had been affected by the computer. "This was inevitable once the Turing Machine was made real in the Von Neumann architecture. Once electronics could express the fundamentals of the idealized Turing Machine, we had a machine that could mimic any physical process imaginable." Now novelists could make realities happen. Now automobile makers could make 'smart' mechanical systems. "It has been merely a matter of transducing energy into and out of electrical forms."

"Computers have so freed our creative imagination that it is right nowadays to ask about taxonomies of computer software. The world is now populated with literally millions of computer programs. We have created a new kind of natural creature, not alive, but living. What would a census of these programs tell us about the human imagination?"

Professor James paused. He told the class that nobody had really tried to do this yet. He told the class that this is something that his generation can barely see, let alone appreciate. One student raised his hands: "What about the sum of four things: human gadgetry, commercial computer software, game software, and TC software?" Another said it should just be gadgets, information, and information manipulation.

"Gadgets, information, and information manipulation miss the

point," said Tim, "The TC is creating a new servant class of living thing. You don't have to be an engineer or rich to have servants any more." Professor James ruefully thought that maybe he should get one of those TCs.

He knew this Chinese technical study group was coming that afternoon to talk to him, of all people, about TCs. "Well, that's L.A. for you." He thought.

The phrase "killer app" was developed in the late 1980s to describe computer programs that 'knock'em dead.' Killer apps are the wonderful ones that people like. Previous computers had a single killer app. For example, "Super Mario Brothers" was the killer app on Nintendo game systems. There were many killer apps for the TC. The TC has to function effectively as a robot servant. Killer apps follow the Coryn Principle. An early joke equated the rules for writing TC applications to the rules of Boy Scouts:

A Television is ...

Trustworthy
Loyal
Helpful
Friendly
Curteous
Kind
Obedient
Cheerful
Thrifty
Brave
Clean
Reverent
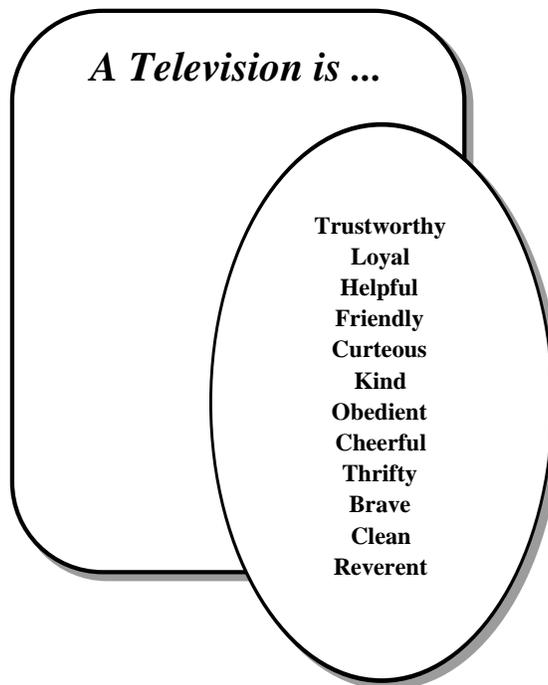
This chapter includes an overview of many applications and how they function in everyday use. Previously mentioned applications include:

Program Listing Plus

Travel Alert

Find a Carpenter

Application Listing Plus

Microsoft Agenda

What's near my house?

Hollywood Make-a-Movie

Westinghouse Find a House Helper Application

Smith's Premium Find a Carpenter Application

Animatronics Teddy Ruxpin

U.S. Flood Warning System

Sam's Global Positioning System

City Events

National MultiList Houses for Sale

There are thousands of these killer applications. The purpose of the Television Computer is constantly evolving with new applications. Because the Television Computer allows anyone to program an application for it, the killer application is as often the one currently enjoyed. For this reason as much as any other, it is difficult to make a list with enduring value. Rather than try, this chapter defines a taxonomy of applications. In doing this, the intention is to capture the flavor of the killer application.

With thousands of apps in use on flexibly programmed devices,

it is difficult to pin down families of apps,but consider four 'families' of apps: **info apps**, **TV actuation apps**, **thoughtful TV apps**, and **special device apps**. Further consider an app distinction between **broadcast apps** and **over-the-counter apps**. Of course there are apps that are members of several families at once, but, as a means of thinking up new killer apps, these distinctions appear to be quite useful.

UCLA had the first system in America that let you stick your memory card into any TC on campus, and it would find the location where you were supposed to be. Randy had his card and had loaded the UCLA finder app the week before. He had registered a meeting with Professor James at 2 PM in the professor's office. When they got to the campus, Randy walked over to a TC*, plugged in his card, and the TC* showed a map with a "you are here" red dot and a "Professor James" blue dot. On a second screen it showed Professor James' location in the computer science building.

"It cost me $10 to get the app," Randy explained. "But I think it is worth it. I can find anybody at UCLA now."

While they walked Nello explained that the first TC finder services studied in microeconomic terms were those installed for the 1996 Olympics in Atlanta. "This is one of the few installations where the economic impact could be measured. I have the report. I will get it to you," he said to Vernon.

By Broadcast, Memory Card, and PC

At a first level of distinction, we can distinguish apps according to how the viewer obtains them. Like there is a television program listing in the newspaper, there is a Television Computer app listing. The TC listing is also available through several TC apps that list and find apps. By pressing **PROG** and **1** on the remote control, the viewer can key in the code number for a particular application. He does not need to get a newspaper. If he keys in 5551212, he gets a default app listing app. Such an app carries an on-line available applications listing, like there are

apps that carry an on-line TV program listing. Selecting an app (like a TV program) automatically sets the Television computer to get the app when it is broadcast.

Another common method of app acquisition, particularly among the more computer savvy viewers, is simply by buying apps on memory cards. There are lots of public domain apps that the cable broadcasters would never broadcast, but which people have a great deal of fun with. For example, there is the gag "meal planner" app that plays games with meals. It tells your wife, or husband, of course, what to fix and how to fix it. The gag is that it interrupts TV viewing to do this.

Finally, viewers can write apps on their PCs and download directly to their Television Computers. This is an extreme thing to do, it may seem, but it is common. We know, for example, of people who maintain large TC app libraries of their own, with their PCs permanently attached to their Television Computers. A widespread saying last year was "they knew the PC was good for something."

Professor James was waiting for them. The guys sat down in his small office to talk. Randy explained the mission. He said the purpose in visiting with Professor James was to understand what computer science thought of the TC.

"Computer Science, as a whole, does not think much of the TC." Professor James explained. "It is a pretty primitive computer that has limited functionality as a data transducer along cable and satellite broadcast. There are some interesting problems in the technology, of course. For example, the operating system running on the TC is quite advanced. Furthermore, scheduling app and info broadcasts on inexpensive head-end equipment is fraught with interesting problems. For example, how does the system modify its schedule in the event of a cable outage. How does the system guarantee security, and how do we make sure that info streams are watched for quality."

Vernon stepped in, "How do you watch info streams?"

"Well, basically we don't. It turns out that Television Computer, Inc., insures the integrity of the data, but not its content. Since individual viewers get to choose the info they get, we let the marketplace take care of the censorship."

Vernon knew he had a problem here. They would have to make the system work but with strict censorship of the info streams. He was beginning to sense a nightmare. If the state was the only producer of info, who would pay for it?

Info Apps

The distinction between pure apps, and pure info was borne of the broadcast media. It is certainly true that informational messages require applications that read and display them, but there is provider independence. The people who write the applications that provide informational messages are not necessarily the same people who provide the informational messages themselves. For example, in the flood warning application, the application is provided by independent contractors while the flood data is provided directly by the weather service. The first level, then, is between the application and the message. People will pay for either one or both. There is a tendency to prefer specific informational applications, since these are likely to deliver only specific messages. People like this because it acts to protect against the "information explosion."

The types of info that are common include advertising that invokes a service or product and advertising that invokes a person or company to call for it. Applications can be specific such as "Find a Language Tutor," "Find Italian Food," "Find the Bus Schedules," "Find a Good Mystery Program," "Find a Gun," "Find the Nearest Hiking Area." Other applications writers have produced more general ones such as "Find a Stock." "Find a Stock" is distributed by a major stock exchange and allows one to find stocks that have various technical attributes such as "dividends exceeding __% of amount invested."

Here is the famous RestaurantsX application from Dallas. The Television Computer has RestaurantsX on its INFO list and this info has been selected.

RestaurantsX   - 47 Listed

Press ENTER for Copyright.
Press 1 2 3 or 4

1 Within a mile

2 Within five miles

3 Within ten miles

4 Within fifty miles

    Press PROG to exit

There are 47 Restaurants within fifty miles. Within 5 miles RestaurantsX simply lists the restaurants since there are only 12 of them and the screens can be selected quickly:

RestaurantsX
   Within 5 Miles - 12 Listed

Press 1 2 3 or 4
 1 Burger King

 2 Catfish King

 3 Dorfmanns Deli

 4 Friday's

Press >> for Next Page
   Press PROG to exit

Selecting a particular restaurant, RestaurantsX gives some essential information:

```
 _____

            ╭─────────────────────────╮
            │  RestaurantsX           │
            │         Friday's        │
            │  231 Main Street.       │
            │  Phone 555-3456         │
            │  Hours 11-Midnight      │
            │   7 Days                │
            │  Bar M-S, Come have fun!│
            │  Press << for Prev Page │
            │   Press PROG to exit    │
            ╰─────────────────────────╯
```

Info is updated on a routine basis: A grand example of this is the use of the "Where You Live" application. This application contains restaurants, museums, gas stations, grocery stores, etc. It is fed by hundreds of info entrepreneurs throughout the nation. The viewer pays for a year of the data at a time. Part of the money the viewers pay the cable publishers for the app is paid to the info entrepreneurs. With the "Where You Live" application you can find the nearest park, all the art museums within five miles and so forth. The Television Computer itself keeps track of changes in its environment of places. If a new place shows up or an old one goes away within three miles, the "Where You Live" app sends a message to info to let the homeowner know about the change.

High speed message streams exist on pay channels created by the national entities such as Dow Jones, the Library of Congress, and the like. These entities nearly all charge the application entrepreneur for a license to use them.

The basic rule of thumb on the cost to the customer to run his stuff through the Television Computer Channel is "now pow later less." This saying means that if an advertiser wants the viewer to have really immediate access, he will pay for it. If access can be delayed, the cost goes down dramatically. The Television Computer is generally thought of as an information *servant* which

watches out for information on behalf of the homeowner. This is unlike CompuServe and Prodigy which give immediate access to a base of data maintained elsewhere. Nobody thinks of CompuServe and Prodigy as "information servants."

Nello asked what economies of scale come out of the computer industry. "Basically, the computer industry makes other industries more efficient and it charges for the equipment and services rendered to achieve those efficiency increases. Furthermore, the computer industry provides boxes that enable people to do things they would simply not be able to do otherwise."

Randy interjected, "Yes, and the TC industry is, in some sense, simply an extension of the computer industry in the realms of robot servants and broadcast data streams."

"Right." Answered Professor James.

All apps can be classified according to the origination from "app entrepreneurs" and "info entrepreneurs." The Television Computer is set up so that an info entrepreneur has to buy a license from an application entrepreneur in order to have his info broadcast to a particular application. For example, a person who gathers information about local restaurants will buy a license from the person who broadcasts a "Local Restaurant Ratings" application. Conversely, in other situations, an application entrepreneur has to "buy a license" to use the information provided by certain other info entrepreneurs. For example, Dow Jones, provides both info and applications. In providing info, it allows other application entrepreneurs a certain level of access to its broadcast information.

It is always important to distinguish apps arising out of app entrepreneurs or info entrepreneurs. This is not so important in the pre-1992 worlds of computers and televisions.

The fact that apps and info have economic ties invites special publishing roles. The publisher is the entity that pays to have

the thing broadcast and charges others for the right to his application or message. For example, there are info applications the viewer can get, such as the Dow Jones app, that a viewer calls in and charges to his credit card for six months' use. Now it is a fact that the Dow Jones app is broadcast once a week in most localities. If a viewer requests that app, then, when it comes into his Television Computer, the Dow Jones app politely requests an audience with the viewer. On the screen appears the message:

```
              DOW JONES APP

        Press 1 2 or 3

            1 for Help

            2 to Order Data

            3 to Sleep


            Press PROG to exit
```

Among the more important classes of info apps are those that provide listings of doctors and lawyers. The sequence "911" or "0" and "Enter" on the remote control is often programmed to give emergency phone numbers through the "Emergency Phone App." The emergency numbers are always the right ones for where the viewer lives.

Nello dropped Vernon back at the Marriott. They were travelling to Boston the next day and Vernon figured to let Nello and Randy have the evening off with their families. He got back to his motel room and ran the Guest Services app to order dinner. This was the first time in a year he had been in the States. He wanted to do some shopping, so he had requested the L.L. Bean App, and the Spiegel Catalog App the night before. This Marriott was a fine place. Not only were the TCs TC*s, they were also interactive.

The Spiegel App was different from a lot of shopping apps. It let him select the type of goods to be sure. When he selected a shirt, he could select the color. In order to get the color right, the Spiegel App gave him the option to correct the television set color. He could match any number of things like white paper, a red apple, or even Crest Toothpaste. He could hold up the paper to the screen and adjust the graphical controls on the TC with the ">" and "<" buttons until he got a decent color match. He chose to just bring up a salad on the screen and adjust the colors to look like lettuce, tomato, and carrot. He liked casual clothes and he was a good dresser. He put his Spiegel order on the hotel bill.

"I wonder what the Marriott did that allowed the Spiegel App to know it could take an order this way?" He wondered.

He went downstairs to see the manager. He had to make arrangements for the Marriott hotels in Boston and Atlanta to provide a common accommodation for him anyway. The manager was a young woman who was very accommodating.

"I noticed that the TC had a Spectravision app on it," he said. "Do you have the head end equipment here?"

"Yes," she said. "In fact Marriott maintains its own cable head ends. Is there something I can do?"

"Yes, I would like to know something about it. Can you show it to me?"

"Sure, come on back this way."

She took him into the offices behind the registration desk and showed him the head end. It was a PC with a couple of extra strange boxes.

"How do you make special apps available to people in the hotel?"

"Well, if you give me an app on a memory card that you want

me to make available, all I do is insert the card here. You know, I have to do this right now anyway. Do you want to see?" Her name was Susan.

"Yeh."

"This is an app that Marriott wants to test market here in Los Angeles. It automatically locates guides who can interpret for foreign visitors. I have this page to go into the hotel's printed app listings. It explains the service."

He picked up the page. It offered, in about 10 languages, including Russian and Chinese, to try to find an interlingual personal guide. The rates would be cheaper on weekdays than weekends. All you had to do was request the App and indicate the language. It would do the rest.

"Now I take the memory card and insert it here. Notice the panel on the display that has the icon for the Interlingual Guide App. Now I drag this into the scheduling window over here."

He thought to himself, "she is pretty proficient with the computer mouse."

"Now watch what happens." Susan pointed to the new window that just appeared on the screen. It said "Password:."

She typed for a second. That window disappeared and another window appeared. This one said, "Publishing the Interlingual Guide App." It listed a whole bunch of things about this app. Vernon noticed the app did not use the TC speaker and could not control volume and channel. It required that the TCs be graphics TCs because of the use of different languages. It was also able to use the interactive back channel and send information directly back to the head end and, interestingly, the cable company!

"So this app works by publishing a request for a guide in the local community?"

"Actually, I think, anywhere within about an hour's drive of here." Susan said. "Our TC stuff is pretty sophisticated at Marriott."

She pressed the "TEST APP QUALITY" button associated with the "Publish to back channel ON" indicator. The button immediately changed to "PASSED QUALITY INSPECTION." "Now we know this app will work," she said.

She clicked the "ACCEPT" button and another window appeared that said, "Please set scheduling information."

"Now I have a choice. The letter from corporate headquarters said that we should schedule this app to play every fifteen minutes at this location, so that is what I am stipulating here." She typed some more.

Now I can ask the head end scheduler to accept or suggest modifications to my schedule requirement. She pressed "ACCEPT." The schedule window went away and now a window appeared that said "RELEASE?."

"It accepted my schedule request. Now all I have to do is release the app for publication and it will be there from now on." She pressed "ACCEPT" a final time. A PC panel came up briefly that said "Interlinguil Guide App Released, Thank you for using Television Computer."

"Now we wait. The app is set up to automatically send messages to corporate to give them an idea of how useful it is. In a couple of months I will either get a letter to remove the app or I will get a final version of the app to mount on the system."

Vernon looked puzzled. She said, "I'm sorry. Is this what you wanted to see?"

"Oh, yes. I'm sorry. It is perfect. I just realized that I ordered dinner for my room and I'm not there."

"Go on up," Susan responded. "I will call the restaurant and let them know you will be there. It won't be a problem."

"Thanks. Thanks for showing me this. It is really very interesting." Vernon walked out and up to his room to get dinner and go to sleep.

TV Actuation Apps

Government notification apps are special because they have authority over the operation of the Television Computer that is matched only by apps that are transferable directly onto a private Television Computer by floppy disk or PC. They can contain "broadcast illegal" commands, such as "Turn TV ON," "Turn Volume UP ," and "Force Main Channel to 3."

The "Tornado Warning App" is one interesting case of a government notification app. The rationale for the tornado warning app was stated in 1989:

"There are only certain locations in North America where Tornados are likely to happen, and then only during certain times of the year. Furthermore, tornados can be tracked by radar. Even the height to the tornado can be known. The weather service has an uplink feed through the national system that orders Television Computers according to their latitude and longitude to accept the Tornado Warning Application. Every Television Computer has memory reserved for important government actions. After the app is loaded in the TC, individual tornado tracks are broadcast as latitudes, and longitudes, and base altitudes. The Tornado Warning Application monitors the changing positions and infers whether there is a tornado danger to the household, office, or plant. If there is a danger, the Tornado Warning Application without any other broadcast instruction, posts this to the attention of the viewers along with emergency instructions; for example:

```
GOVERNMENT ALERT

TORNADO HEADED TOWARD YOU
Estimated Time of Arrival: 62
Seconds!
Seek Safety away From Windows
and Underground If Possible!


Press PROG to exit
```

The seconds tick down on the screen according to the Television Computer's instantaneous estimate. A voice alarm from a separate cable feed gives a verbal warning message over the Television Computer speaker."

Government warnings of all types are available. These include water quality warnings, flood, hurricane, earthquake, and fire. Riot warnings have been available in certain American cities for at least six months now. The Government is still working with the idea of providing warnings as detailed as warnings to single households "come out with your hands up!" Fortunately, the Government cannot force a response or watch what you are doing. The Television Computer is a robot servant, not a big brother.

When Randy got home, Marilyn had a roast beef dinner prepared, and the kids were there. Randy had gotten used to the fact that sometimes either Randy Jr. or Anne would not be there. He liked the idea of having a real family dinner before having to disappear for ten days.

At dinner Randy started the conversation, "I have a feeling that after this trip I am going to want to put the TCs in a closet for about a year. The last couple of days have been a pretty intense TC overload."

Marilyn said, "You put your TC in the closet, dear."

The kids laughed.

"OK, do ya'll have any plans for the weekend?" Randy wanted to know. He always wanted to know if Marilyn was planning something for the family while he was gone.

"We want to go to the mountains, Dad," said Randy Jr.   "I joined an adventure club and found out about a neat place. I have some pictures and a description on my TC upstairs. They found an old Spanish ruin." Randy Jr. had his TC connected to his PC upstairs. Every afternoon when he came home from school he would go up to it and check out the messages. He had a message on the ruin and how to get to it. He kept info like the location of the ruin on his PC since it had a hard disk and he could keep the info for years.

"Sounds great," said Randy. He was hoping Marilyn was going to buy into Randy Jr.'s idea.

"I called Jennifer up the street. Jeremy and Patricia want to go too. We are all going to pack off for the mountains. It should be fun," said Marilyn. Patricia was Anne's best friend.

"Well. I have to get ready to go tonight. Does anybody want anything from the east coast?"

"Could you bring us some maple syrup, Dad?"   Anne remembered he did this once when he went to Boston. It was neat.

"Sure, I'll try."

Randy went into the family room, picked up his personal remote control and turned on the TV to rest for a few minutes. The TC automatically tuned the evening news for him and indicated with a blue dot on the upper right of the screen that he had some new messages waiting to be read. He pressed the INFO button and saw that another guy had answered his golf ad. He

would call him after he got back. He also saw that the TC wanted to be backed up to a VCR tape. He slipped a tape in and selected "proceed with backup." He figured this was probably a good idea in any event since he was leaving for awhile.

While the VCR was working, he took a memory card out of the drawer that had his "floating address" on it and slipped it into the TC. The TC indicated it had updated his preferences to the card and had loaded the apps that could take a floating address to the card. He would be able to pop this into the TC at the Marriott in Boston. For info he could receive nationally, this would work. More importantly, though, the television would know what shows he wanted to watch.

Thoughtful TV Apps

The Thoughtful TV app is one that tries to anticipate needs of the viewer. This is one that reasons about its environment. The immediate environment accessible to the thoughtful TV is, of course, the viewing patterns of the viewer. For Television Computers embedded in TVs this can include volume control as well as channel, brightness, etc., all conditioned by time of day, day of the week, month of the year and so on. Furthermore, if program data is available, the Thoughtful TV app has this information available as the basis for "being considerate and thoughtful."

TC environments can be richer than simply program viewing patterns. For example, interesting Thoughtful TV apps exist that watch app running patterns. Does a viewer generally want Italian food on Sundays, and are there any new Italian restaurants within two miles? This app is pretty sophisticated and requires a Television Computer with extended memory.

Other Thoughtful TV apps are improved with digital widgets. For example, TC apps are available over the counter with temperature, barometric pressure and rainfall monitors. Here a person is reminded to check the windows on the cars if it rains. Another digital widget takes a noise cancelling microphone, one with two directional microphones pointed in opposite directions,

and does an interesting job of automatically adjusting the volume control on the TV set to compensate one way or the other for the noise in the room. Kid noise gets "anticompensated" while adult noise gets "compensated."

Among the more common Thoughtful TV apps are those used to censor viewing and those used to schedule viewing. The censor apps are sold both nationally and locally. Parents have been able to use them to guarantee that their kids see only things that the parents feel are appropriate. The Television Computer is "locked on," with the application itself capable of reporting if it has been tampered with. The application then censors viewing programs. The screen for a particular channel may be changed to a blue screen when a program is not available.

Some automatic program schedulers get a little bit of getting used to. These simulate a new, virtual, set of channels for the TV. What they do is figure out how to pack the available programming into as few channels as possible. The penultimate instance of this is "Scheduler 3" from Wisconsin. This is the well known scheduler that gives the viewer exactly three stations, 2, 3, and 4 to watch. Again, the Television Computer is not moving stations around, it fakes its channel changer into believing channel 43, for example, is channel 2 between 8 and 8:30 for "The Simpsons." After 8:30, perhaps, channel 16 is now channel 2 for the next thirty minutes. If the viewer suspects a robot scheduler is running, he can check by turning off the TV-TC switch to let the regular cable through.

Some rogue "Thoughtful TV" applications also exist. For example, broadcasters do not broadcast the infamous "Commercial Canceller" application. This has to be obtained on floppy disk or memory card. However, fortunately, most people get pretty tired of television programming that has cancelled commercials -- it is hard to fill the empty space in a more pleasant way. There are "anti-commercial cancelling programs" that broadcasters use to place commercials in time slots that are hard to predict and cancel.

Still another class of Thoughtful TV app is the "news prioritizer." This one is an information exploration app that serves on request of the **APPS** button:

```
        APPS   Page 1 of 1

     Press 1, 2, 3, or 4

          1 News Prioritizer
          2 Travel Alert
          3 Find an Electrician
          4 Candidates for Office



              Press PROG to exit
```
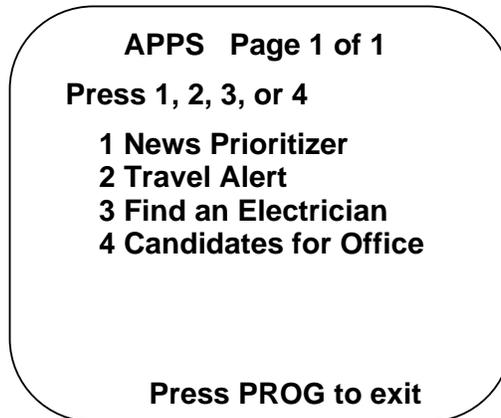
Selecting the News Prioritizer gives the viewer the ability to watch the news scroll by, have the news prioritizer intercept specific pieces of news and post as an info bulletin, and browse the news by topic:

```
        News Prioritizer

     Press 1 2 3 or 4
        1  Autoplay News Line

        2 Post to Info

        3 Browse News

        4 Help

            Press PROG to exit
```
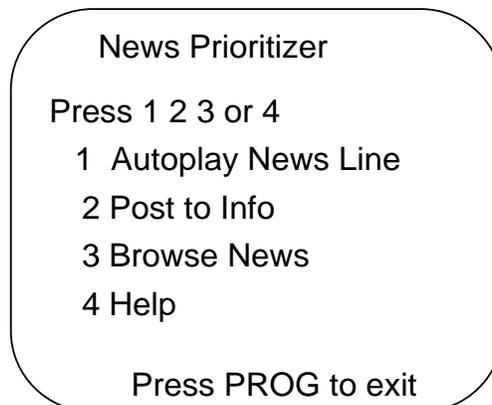
Interactive Control of the application is a distinguishing feature. Of course, the success of the Television Computer has centered around the lack of the need for interactive control. But

certain applications, such as games, demand constant interactive control. There are interactive control applications that require special widgets such as game controllers and animatronics, some that fit the Thoughtful TV pattern, such as ones that monitor blood pressure (particularly useful during flu season), and those that fit the info paradigm, such as the Library of Congress Book Search App.

One of the most welcome thoughtful TV apps has been the "School Closing" apps. School closings are announced only to the Televisions in households that want them. The app itself monitors for information about its lists of schools of interest. These come in two flavors: a version that is broadcast free and cannot actuate a TV and a version available on memory card that can turn on a TV and signal the household of the announcement.

At his apartment Nello was settling down with a book describing the Chinese economic system. He knew that the next day on the plane would afford him an opportunity to read quite a bit more, so he wanted to go ahead and start. He had a combination TC TV VCR unit in his living room. The television turned on at seven and put a message on the screen to ask if he had fed the cat. He tended to forget to feed the cat.

He looked at the messages on TCs recordings. There had been three TV shows recorded in the last day. One of them was a special on Southern Africa that he was interested in watching. He selected that one and went back to his book. He ignored the beep from TC that indicated the show was ready to play off the VCR and finished the chapter. Then he watched the show for awhile.

The show got him thinking about how the TC might be used across national systems. An economist is a psychologist first and foremost. An interesting paper might well be to look at the cross section of apps and info services by country. There might be some predictive value to this in an economic sense. Economists always have difficulties with getting indices of highly local economic activity. There were "grass fire" theories of economics that predicted economic change not from macro-economics but from

micro-economics. He wondered whether anybody had looked.

Nello, like Randy, updated his "floating TC card" for the trip to Boston. He took out his special pen pad remote control and slipped his floating TC card into it. This was a small, wallet-like, unit that allowed him to scribble text into any TC and also held his floating card. His sister had given him the thing for his birthday. It had his business card on the back.

Special Device Apps

The animatronics app from Disney and the noise cancelling microphone app are examples of device-oriented apps. Such apps are fairly common. For example, infrared keyboards are available with "Keyboard Service" apps that allow one to type directly into apps. These include various augmented versions of "info apps" and "thoughtful TV apps." Another class is the "House Control" app, that uses television programming schedules to control lights in the room and various appliances. People have used the TC for alerting the presence of water in the basement and intruders in the home.

Unlike most home PCs, the TC uses very little electricity and is always on. Many devices that could work on PCs or dedicated microprocessors are used on TCs. Besides the fact that the TC is always on, the TC is a computer that can post a message on the TV.

Server Apps

There is a class of applications that is popular but invisible to most people. This is the class of server apps. Info entrepreneurs use app servers that handle their info. But the server apps are more generally thought of as providing special services aside from handling info. For example, if a viewer does not like the "Press 1 2 or 3" on the screen, he can run the Incremental Scroller App. This app takes effect immediately and immediately changes the user interface. The News Prioritizer panel shown above would look like this:

```
              News Prioritizer

          Press ENTER to select

          ============[by App]
            Autoplay News Line
            Post to Info
            Browse News
            Help
          ==================

            Press PROG to exit
```
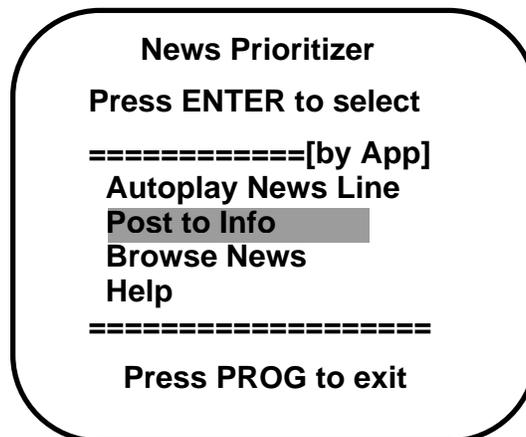
Now the ">" and "<" keys on the remote control move the bar to select an item. If there is more than one page, the ">>" and "<<" page forward and back. The ENTER key performs the action to run or otherwise enable the action. The TC is engineered so that apps can be produced that go much further than this simple change in appearance. Most TC* graphics applications are made possible because of servant apps that alter the basic form of the information presented to the viewer.

Chapter 4
Publishing Info and Apps

In looking for books to put up in her attic, Betty saw one that made her remember. Neil Postman said in his influential book of 1992 that technolopoly "is what happens to society when the defenses against information glut have broken down." Too much information throws societal mechanisms like family and religion into disarray. She remembered how strongly she agreed with Postman, and how strongly she agreed that the information providers were in control. Now, though, the TC gave her control. Computers did not seem so evil now that they were provided in a form that let you personally tailor information to your needs and desires. All Betty had to do was pick the applications she wanted to run, like she used to pick TV programs. Neil Postman had not realized the defense against 'technolopoly' was the same instrument as the thing that created the opportunity for it. "This book could go to the attic for sure," she thought.

Her co-workers at the R.R. Donnelley Boston office seemed happy too. Even the paper manufacturers were happier that, with the price of paper higher, they did not need to cut so many trees to feed the publishing industry's insatiable desire for publishing. R.R. Donnelley was now one of the largest sellers of catalogue advertisements on the TC, thanks to their wonderful "RR Donnelley Browser" series derived from the "RR Donnelley Yellow Pages." Betty no longer felt that pang of guilt as she saw those huge volumes of information printed in huge quantities. People did not have to be overwhelmed with stuff they were not interested in receiving. Postman's book really seemed naive now.

When the Chinese delegation visited the next day to talk with the R.R. Donnelley people, she brought up Postman's book. "Yes," said Nello, "I read that book, but I don't remember what it was about."

Everyone was surprised when Vernon said he had just read the book with great interest. "Wasn't this the problem with the TC? Didn't it swamp everybody with information?"

An uneasy quiet fell over the group. Where had this guy Vernon been for the last five years? Vernon recognized his faux pax, laughed, and said "I wanted to bring this up to R.R. Donnelley because you, of all groups, would know if people were overcome by information. Have there been any concerns in this area?"

"Not with the advent of the Television Computer," Betty said, a bit more relaxed.

Publishing controls the dissemination of information. People pay publishers because they are efficient at information distribution. In the Television Computer world, publishing is the principal service mechanism. Just as in newspaper and magazine publishing, the editors decide or referee the content of what is published.

Publishing is the major functional component of the TC. There are several forms of publishing from broadcast, to store-bought software, to book and magazine style publication via TC. It is, in general, the publisher's role to maintain the quality of his product to the consumer. These three publication channels have different publishing rules.

Broadcast Publication

Later in the afternoon the guys visited Mitch Kapoor, founder of Lotus and currently running the EFF or Electronic Frontiers Foundation.

Mitch Kapoor had led the point-to-point telephony revolution of

the early 1990s, so it was natural to visit him on his view of the TC. "I heard Dr. Thibadeau talk about this thing in 1992, and I found him arrogant. He obviously does not know the amount of damage he has wrought by allowing for asymmetric data communications. Dr. Thibadeau talked about some mumbo jumbo he called 'symmetrically enhanced asymmetric.' Obviously data communications is not worth much unless it is fully symmetric."

The Television Computer demonstrates the value of asymmetric data communications. Asymmetric, broadcast, data communications does not, of course, exist in a pure form in the Television Computer. Every TC has the capacity to turn 'fully interactive' and certain people use the phone system to call back to order or respond. The following graph illustrates a base truth that is not changing. It is cheaper to get a very large bandwidth to a point by broadcast than by point-to-point switching. This profound economic advantage to broadcast means the Television Computer always has a future. Even when point-point bandwidths go up, the point-multipoint, or broadcast, bandwidths will also have risen, and, more importantly, keep their massive channel capacity superiority. It is simply a matter of the cost of delivery. So while symmetric communication is nice, 'symmetrically enhanced asymmetric' is much nicer if our desire is to have robot information servants out of computers.
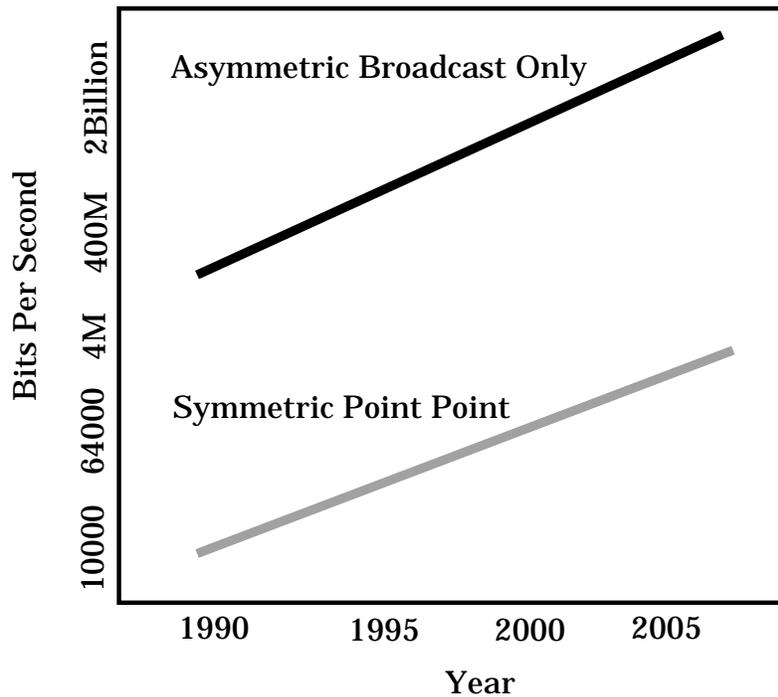
"But our mission is not to evaluate high bandwidth point-point communications. This is too expensive for the Chinese, " Nello was not impressed with Mitch's idea. At first he thought Mitch might not own a TC, like Vernon and Professor James.

Mitch showed them video teleconferencing between people. He rang up a friend in Hawaii and asked about the number of people that could be expected at his talk the next month. This looked very good on his 3D display. The group was impressed.

"I heard that you or one of your group had a run in with this cable operator, Glenn Williams?" said Vernon.

"That was not me, but I understand the sympathies of the people who did. They regard Glenn as one of the real anti-progress people because he demonstrated the first commercial TC success. It caused AT&T to drop its funding of optical fiber into the house. It was Minnesota, right?"

Randy nodded. Glenn's first fame occurred when he did a deal with AT&T to provide high bandwidth home services bypassing the local telephone companies. People liked the TC and pressed this further fission of the telephone companies. A cable operator got public support instead of public derision.

"It set back our efforts to fund the infrastructure for the bandwidths we need. People don't know what they are missing, and Glenn is one of the people that some people seem to think are anti-progressive. Not me."

"Who are the people?"

"A shadow group made up of video teleconferencing people, I think. You know, I have only read what you have, I think." It dawned on Vernon, after seeing Mitch's demonstration, that Mitch was one of these video teleconferencing promoters. Even Vernon knew the bandwidth necessary for point-point video teleconferences among consumers was many years in the future.

Mitch's TV turned on. It showed a message that the Digital Equipment Company meeting was starting in 30 minutes downtown, across the river, in Boston. Mitch had to leave.

Vernon thought to himself, "Well, who cares? China is not going to develop high capacity point-point communications to homes for obvious reasons. I will put in a sentence or two reminding them of the political absurdity of such an idea even if it was practical."

The three types of Broadcast Publication are "Uplink Broadcaster," "Cable System," and "Private."   Television Computer, Inc., introduced the first 100% uplink data channel, and that had capacity reserved for local cable operator and private insertion. The local cable systems typically enjoy about 25% of the main data channel. Unlike program systems, several broadcasters can share the same channels without interference. The Television Computer Channel is the default uplink broadcast

channel for the Television Computers. However, unlike regular programming channels, the TC Channel provides about 25% of the programming of info and apps. Local cable companies provide another 25% through their head ends. An additional 25% is leased to other uplink and downlink broadcasters, like Sony and IBM. Finally, about 10% is reserved for private use and the remaining 15% is not allocated at this date.

Cable and Broadcast Companies. Obviously the content broadcast cannot be indiscriminate. For this reason the TC incorporates publishers controls. These include:

- A means for authorizing broadcast. This involves a method built into the broadcast injectors that checks app and info structure to pass inspection. The means for authorizing broadcast is a dynamically keyed encryption method. The receive matcher has an encryption circuit.   No info can be broadcast unless an app is available on the injector that can accept the info.

- At a second level, apps and info are matched to each other through a second authorization scheme.   This encryption is "object oriented" in that an app or info can inherit authorization from an app class.

- A means for verifying all displayed info. This is achieved because the app or info must be authorized by a TC, and the TC itself encrypts the display method. In other words, it is difficult to write code that can find, display, and write words to it independent of the mechanism that allows the publisher to see those words. This is certainly true of the most basic TC that only has a character generator and a blue screen blank out. The TC* has a writable graphical frame store that makes publishing control more difficult. Apps that are authorized to run on the graphical frame store use a similar mechanism to permit publishing control of the graphical use of that frame store. The TC* is a somewhat more open architecture that cannot hinder "hacker intrusions" to the extent provided by the TC. The use of the audio speaker is similarly controlled in providing ready

access to anything an app or info can "sound or say."

- Finally, the mechanisms provided by the Television Computer Channel allow people to purchase info and apps in a number of ways: (a) apps can receive enabling info to a particular serial number or global position, (b) info can receive enabling info, technically the same as (a), and (c) channels can be enabled to a particular cable installation as was standard in 1992.

Government. Governmental authorization is required to broadcast commands that can turn on TVs change watching channels, change volume, and so on. An app that has such actuation control gets an exclamation mark "!" in its title. The viewer, in looking at his running apps can know if any one of them can alter his viewing. Ultimately the control over the right to broadcast 'dangerous' apps is achieved by statute similar to controlling the distribution of prescription drugs. The FCC provides app approval for privileged broadcast apps. However, the FCC does not have to approve actuation control apps that are distributed on VCR tape or Memory Card, although "truth in packaging" statutes require that an app name indicate actuation control with the exclamation mark.

The next day Randy had arranged a meeting with an ardent proponent of the TC.

"What Mitch did not tell you" said, Jack Blanchford, the President of TCSoft, "was that that message you saw on his TC TV was generated by our Boston K Group App. It is an expensive app distributed on memory card to only 150 of the movers and shakers in the Boston computer industry. It keeps them apprised of valuable meetings."

Randy asked, "TCSoft is the world leader in special interest apps. Your problems must be enormous."

"The secret is simple. In each group, our members are also our info providers. For example, we have a national group of 10,000, called the Committee of 10,000, that works TC integration issues

within the computer industry. Again, it is mainly a system of providing information when people really want to get it. Even if it is at home on TV at six in the morning. For that, we broadcast nationally and can track people to their motel rooms. People simply stick their identification memory card into the motel TC."

Vernon interjected, "We heard that it was the computer industry that most fought the TC. Second only to the telephone companies."

"No, like the telephone companies quickly realized that the TC multiplied their point-to-point volumes, particularly at central switching stations, the computer industry quickly realized how many problems the TC solved for them. Their concern was more that they wanted to be Television Computer, Inc. They wanted to produce the computer boxes or be the Television Computer Channel. They tried to tell Scientific Atlanta that it was technically impossible to build computer boxes at the prices of TCs. It was not in their best interests to sell inexpensive boxes. Scientific Atlanta was one of the few companies with the vertical integration in cable and satellite to make the inexpensive TC economically possible. A computer maker could never do it alone. Hewlett-Packard produced the boxes for TVAnswer but only because the boxes controlled the radio frequency infrastructure. On cheap boxes alone, HP would be out of business."

Software Publication

Software publishing is specially protected in the Television Computer through the use of software "objects" for apps and info. In most computer architectures, there is a distinction between program and data. In the Television Computer architecture this distinction is stronger than ever because there is always a distinction between apps and info and there is always an encrypted relationship. The one authorizes the many. Technically, this is achieved by a singular mechanism: apps authorize info. When a new app receives authorization for info, for example, a novel Dow Jones reader, what is happening is that it inherits the authorization from an app class, defined by Dow Jones. When info receives authorization for an app, for example,

"Local Info," it inherits the authorization from an app class defined by the company that produces the app "Local Info." Info sharing between apps is possible through shared app classes. The "Local Info" class is provided by TC as a base. This class can be used to write applications that will read local info or to write info that can be read by other "Local Info" apps.

Software publishing is controlled by restricting access to app classes that can authorize new apps and new info. A company like Lotus sells other entrepreneurs access to its info broadcasts. This form of software publishing restriction is possible with the Television Computer.

Software publishing is supported because there are special apps that should be distributed without broadcast. For example, the encyclopedia apps are distributed on CD Roms for the PC. Some of these include memory cards for the TC that can grab encyclopedia updates over the TV.

The next day the group visited Fluent Machines in Natick, Massachusetts. This was a company that specialized in handling television programs in a computer environment. There was a new class of TC that was being introduced on the market that had a built in optical disk drive and "store and forward" video capability. It gave an instantaneous playback. Waiting for the VCR to rewind would be a thing of the past.

The president of Fluent began the presentation, "There is a clear distinction between the Television Computer that at best only routes television programming and a Fluent Machine box that can actively manipulate television programming. A Fluent TC, for example, gives instantaneous play on demand of Headline News. Furthermore, you can chop out any section for permanent recording on a modern hard disk."

"You mean you can edit the video you receive?" asked Randy.

"Yes, and you can cause video to be automatically stored for

long term storage and arbitrary editing," said the president. "The Fluent TC was developed to combine the functionality of the TC and the Fluent system running on a PC. Now it is economically possible to do this. Our Fluent TC sells for one thousand bucks with a hard disk drive capable of storing one hour of live video. We have the special editing remote you see over on the table." He pointed to a Fluent TC. The editing remote was recognizable because it had a 'jogging' knob on it that permitted you to jog frame by frame through the video.

Vernon asked, "What are the uses that people have for this besides editing video? What about copyright protection?" He saw that this would be particularly interesting for the Chinese. Since copyright protection was not a problem, local regions could take in video education sequences and customize them for local consumption. Furthermore, with the portable storage capability, they could have a few main TCs, one for each factory or farm, and guarantee that a national broadcast could be replayed if necessary for workers on different shifts.

"Well, copyright protection tends to be handling itself," a Fluent executive cut in. "There is so much video that is being produced today that the video producers worry less about copyright protection except in certain special markets. For example, if there is a new movie release, there is a period of time that that release goes through pay-per-view. During that time the video signal will fail to record properly. With the Fluent TC a show will automatically be skipped that has copyright protection turned on. Some of the apps that are available will even explain to the viewer with a message describing what happened. For example, the Microsoft Scheduling App 4.0 has Fluent TC support and does this."

"From the experience we have with our marketing trials, the Fluent TC makes possible special interest video broadcasts. While this could be done with VCRs, the problems with manipulating tapes made this rather hard for most people to deal with." The executive from Fluent had red hair. He was going to seize control of the discussion. The president of Fluent was silent. Randy and

Nello were getting interested.

"We expect a number of magazine producers to step up to producing their magazines for the TC. "Car and Driver," for example, already produces car reviews as a video magazine. With the Fluent TC a person can select which car he wants to see reviewed. It's like a magazine, with a table of contents. The Fluent software, both in the head ends and in the TCs, allows the video information to be indexed to a resolution measured in hundredths of a second."

Randy just had to ask, "What about Consumer Reports?"

"Yep, they have announced their intention to distribute through the Fluency system. Of course they do not have the money that most magazines have since they do not allow advertising. But they can get people to pay. More people pay than before. The TC makes this possible, and Fluency makes it possible to provide the magazine on demand in video form."

Vernon looked down at the business cards on the table in front of him. The Fluent executive's name was Paul. They talked on for another two hours about the possibilities. Vernon was sure that this stuff was important for the Chinese delegation to see. He just wanted to make sure that they had enough of an idea about the special publications to understand their practical applications in China.

Book, Magazine, and Newspaper Publication.

The "Jokes For Ten Year Olds" app has now replaced the "Dinosaur Joke Book" from Walden's Bookstore. The cost is about the same but the jokes are distributed from birthday to birthday and parents don't have to keep the book. "*Boat"* and *"Car and Driver"* magazine now broadcast new product descriptions but only the people who subscribe, for a dollar a month, get the descriptions on the TC* machines.

Newspapers participate in providing the local cable companies

with their publishing and editorial functions. The want ads section in several newspapers has disappeared, since it is possible for ads to be perfectly targeted to interested buyers. Because of the focus of Television Computers on small localities through head end injector sites such as local cable companies and hotels, the amount of data transacted over the entire national cable system far exceeds the capacity of a single broadband network. The Television Computer makes it possible to balance broadcast over 24 hours without appreciably inconveniencing viewers. Newspaper companies and other tabloid publishers understand all of these matters well and know how to interact with the population to provide the properly edited services.

On the drive back to Boston Vernon said, "I think the trip to Boston has been worthwhile. We need to get down to Atlanta to the medical society meeting. They are supposed to be discussing the role of the TC in medicine. This should be of interest."

"Just thinking back, I hope Mitch Kapoor didn't take offense at us," said Randy. "He has maintained his mission for almost ten years now and I applaud it."

"It's just that a guy who owns a TC should know better than to complain that broadcasting digital data is phoey," said Nello.

"Well, a good slave gets no congratulations. The TC is a good slave. Maybe it is OK if Mitch denies the TC has value." Vernon found himself inadvertently coming to the defense of the Television Computer. This was not like him.

Chapter 5
Non-Consumer Uses of
Television Computers

The sign in front of the conference said "American Medical Association: TC Subcommittee on Appropriate Information Filters." Paul walked in. He had had lunch with this curious crew of guys working for the Chinese chamber of commerce. He had invited them to the afternoon session. He knew his job was to get his company's products announced to as many doctors as possible, but with doctors deciding about what they needed to know, it was harder than ever to peddle off goods.

The Chairman indicated that the latest guidelines permitted information filter categories that would pass drug and device alerts to doctors using the particular drugs and devices, and would inhibit standard product announcements. A new product announcement would not alert a doctor. However, he was free to peruse catalogues of apps provided by the drug companies and equipment manufacturers to gather products in a category of interest to him. Alerts would have to be structured to indicate any of the listed alert types. "If a doctor sees more than one alert a day he sees too many," the chairman said.

Paul spoke up, "If we produce a better syringe, that is important. But no doctor is looking out for a better syringe! How are they going to know about it? We need to have alerts."

Saul, one of the committee members replied, "Look, you are free

to broadcast an app from your own company. A doctor can run your company app continuously to monitor for your products. It's up to you to figure out how to entice doctors to load your app. You can always petition a major distributor to broadcast your notice through one of their apps. There are lots of commercial methods of communicating with doctors outside of those generated by the AMA."

"Our company certainly appreciates these alternative communication channels," replied Paul. "However, we are concerned that the AMA is missing a major opportunity to regulate product quality. A new product alert approved by the AMA is going to have substantially more impact, and more benefit, if it is allowed. Nobody knows when and where a new product revolution is going to come from. There needs to be a vehicle for gaining AMA or FDA approval on a product announcement to go to alert status."

The Chairman cut in and said, "Paul, I have known you for several years. I know this is important to you, but it would create confusion and increase costs. You, your distributors, or your own trade organization, is free to make available announcements of great importance independent of the AMA or FDA. Physicians would certainly be interested in this. If the FDA or the AMA independently decides that something new is important, we can certainly send an alert. But we are not going to process applications on the subject!"

Paul sat back an inch and waited for his next opportunity. TCs had been on every doc's desk and in most of their homes for about a couple of years now, and things were getting hard to change.

The non-consumer uses of the TC include industrial, commercial, medical, governmental, and military uses. The killer applications described in the previous chapters are multiplied by this factor. It turns out the Television Computer has a pervasiveness that exceeds Television in pre-TC times. Prior to 1992 it was hard to justify a TV on every office worker's desk. Now, offices, hospitals, and factories are just as likely to get

broadcast TV. The reason is that offices and factories can have either local cable equipment like many hotels or numbers of companies can share special data channels. Since applications and info are bound to each other, the info meant for one office, indeed one desk in one office, are not confused with the info meant for another. It should come as no surprise to find some Television Computers inside of PC desktop computers. These include tuners for data and use the PC for some functions such as external memory and download of special, extremely sensitive, apps.

In the discussion of the various private applications of Television Computers, it is important to recognize that the hardware is unchanged. The limit is the ability to broadcast. This is not at all a problem for just a few channels, and it can be done inexpensively. Certainly, many of the applications discussed in this chapter can independently justify the costs of a broadband cable.

Industrial Applications. Many manufacturing facilities suffer from the absence of simple messaging facilities that display different info on every TV controlled from a central messaging resource. For example, assembly lines have been greatly improved because position specific info is generated automatically from assembly scheduling demons. Lines stop faster and start faster. They are less likely to encounter problems because they can more gracefully adapt to changing conditions at remote locations including remote supplier locations. There is only one place that needs to be notified and that place can nearly instantly get the message at low cost to inexpensive receiving locations.

Job shop manufacturing is similarly improved. Here the new idea is the broadcast of applications and videos that provide special instructions, with the capability of different instructions at any of hundreds of locations. The "Pause" key on the remote control combined with highly developed scheduling programs has improved job shop performance because the experts doing the work have better control over what they need to do and when they need to do it. The price per station is the price of a TV and a

computer game wired for cable TV. A side effect now common is mixing of commercial data and program channels so that a worker in a job shop can be tracking down a carpenter to fix his home windows without negatively impacting his job. The Television Computer is tracking down the carpenter for him while he does his job.

The white collar aspects of industry have been similarly impacted through the use of spatial targeting for reports. Managers with workstations that provide streaming info feeds have been able to get messages out more quickly and efficiently and can even trouble other managers off site. This is made possible through the micro-ad and the capability of placing the micro-ad out to an app on a memory card that the manager carries with him. The info can only be read by that particular app. The company need only know what cable area their manager is in. The price for this communication, per character, is lower than the price of alternate methods. Since most hotels have Television Computers with graphics, necessary communication is improved even further with pictures.

Commercial Applications. The commercial applications of Television Computers are numerous from the use of Television Computers in stadiums to control crowd flow to special "city wide" and "county wide" commercial recreations.

One recreation that has met with some interesting success has been the game of finding the latitude, longitude, and altitude of a "Treasure Ticket" based on hints given by commercial advertisers. No purchase necessary, but one cannot guess too fast since the broadcast that the "Treasure Trapper" can detect comes only once every four hours. The cost of the app, in a memory card, is $10, but, it is like a lottery ticket that takes some deduction and lucky guessing, and the app only works for a few days for the $10.

Variants on this, not dependent on global position, include problem solving applications on a national scale that have

empowered wealthy individuals to invest in large scale educational activities. This is like game shows that run nationally with thousands of questions, different for different ticket holders. The "Ross Perot" app leads people on a journey through economic statistics. Because of the encryption security methods, a winner of a "Ross Perot Cash Award" is specific to a ticket, and because the questions are broadcast at known times, the fastest answers win.

Banks with many branches, real estate offices, fast food places, police precinct stations, churches, and a variety of other commercial and non-profit entities that maintain several locations in a cable broadcast area have benefited greatly. Store managers and ministers have been able to establish communications among their peers on a day to day basis without the imposition of "telephone tag" or "meeting mania." And certainly without the expense of other methods. This was all done without any addition of infrastructure from the phone or television industries.

Other commercial applications are more obvious. For example, the Dow Jones application described previously is clearly commercial. All the micro-ad capability properly belongs in the commercial application area. It can be said that the Television Computer is principally a commercial device implanted in the home.

The next morning Vernon was sick. The food at the AMA convention had not agreed with him. "These Americans eat rich," he thought. He called Randy and told him he needed to get to a doctor. Randy made arrangements with a local hospital in Atlanta, and had called Nello to go have fun. He cancelled the visit with the Television Production guys to discuss how the TC had changed their lives. When they arrived at the hospital, they encountered an even more interesting story.

Nurse Phillips had set up Mr. Williams with a Hospital TC app that would wake Mr. Williams every three hours and ask him to press the nurse call button. The doctors were concerned that

Mr. Williams might lapse into a coma without any change of vital signs. The head injury was hard to interpret.

At about 3 AM, the TC/TV at Nurse Phillips desk flashed, "Mr. Williams did not press the nurse call button when requested. Please check him." Nurse Phillips went in and could not waken him. Then, suddenly, the EKG went flat and the monitors sounded their alarms. She signalled for emergency action, but they could not save him. She, sadly, ran the "Signal Termination" app.

Jonathan, sitting downstairs watching TV, got the message, "Patient death in room 225B, please respond immediately." Jonathan pressed his remote control enter button to indicate he had gotten the message, pulled the stretcher out of the corner, and proceeded upstairs.

He encountered Police. Something was wrong. Nurse Phillips was in a corner with two detectives. He went ahead and got Mr. Williams off the bed, and took him downstairs. It was an autopsy for sure.

Vernon asked Nurse Phillips why she was so shaky that morning. She explained she was tired and that a very important man had died last night under odd circumstances. They suspected cyanide. Vernon asked who the guy was.

"He was the owner of several cable companies." she said. "The police think he was murdered. His name was Glenn Williams."

Medical Applications. Television in hospitals has changed. Memory cards allow patient records to chase the patient at little additional expense. Different wards can get different types of television programming with obvious implications for pediatrics. Television programming that teaches about types of illnesses, types of procedures, and the like, is delivered only to the pertinent beds. On patient records, different details are enabled at different locations. For example, costing profiles needed for administrators, doctors, and patients are different. Hospitals

have been truly revolutionized without the addition of a single new wire.

A number of hospitals and insurers have leased uplink capability in order to connect over broad areas including clinics that might otherwise not be able to afford expensive communications even from rich parent hospitals. Information can follow doctors wherever they are, in a fashion similar to manufacturing managers. The same is true, wonderfully, for nurses and other staff for whom it was previously too expensive to equip with pagers. This is not a replacement for the instantaneous access provided by pagers, but it does allow detailed reviews at remote locations that pagers do not provide and at a price lower in both dollars and effort of a fax.

Governmental Applications. Of course it made headlines when the U.S. Government leased an entire TV broadcast channel for its exclusive use with Television Computers. But the ability to achieve low cost, high bandwidth, communications without altering infrastructure was readily demonstrated by dozens of "info" and "app" companies on the Washington beltway. Now even the forest service can afford to have broadcast channel capacity with an interesting amount of data. The micro-ad is used a lot as government employees seek new positions at other locations. New rules and regulations immediately get out to the televisions of the government offices that must enforce them. Companies, hospitals, and local governments, all can receive data that the apps provided to them are empowered to receive. The people, and thereby the congress and president, know immediately when the bureaucracy has fouled up and when it has gotten a home run.

Nello walked in and said that the TC/TV in the waiting room was showing the morning news and indicated that there had been a murder here that night. The murder was of Mr. Williams, a wealthy cable operator. Mr. Williams, Nello thought, was on their list to visit the next day.

Nurse Phillips repeated her story. They called Randy, and

even Randy was up to date. He said the police were looking into Mr. Williams business dealings for people who might have the motive, will, and way, to kill him. It used to be that wealthy cable operators were not well liked by the population, but now that the population could participate in TV, most people had developed respect for these guys.

Focus shifted on places where the TC may have upset the apple-cart for certain special interests. Vernon immediately recognized the opportunity. He thought in Chinese, "If I can figure out who wanted to kill Mr. Williams, I can figure out what a TC revolution crushes. This will be of interest."

Vernon said, "I want to meet with the detectives. Can you arrange it?"

Randy replied, "Probably, but we have the meeting with the Weather Channel this afternoon."

"Tomorrow afternoon would be good. Mr. Williams won't be there." Nobody laughed.

Military Applications. Military command and control, aside from issues of logistics, have been revolutionized. It is now possible to inexpensively broadcast messages that are different depending on what the Global Positioning System (GPS) data provides. A ship in one part of the harbor receives different instructions from a ship in another. Airplanes flying over particular locations receive broadcasts that vary. There is immediate notification of friend or foe on the ground because displays automatically update through relatively safe receive only mechanisms. Of course the military applications, excepting in logistics, training, and social activities, employ specialized versions of Television Computers. However, this is just about the only area where specialized versions are required.

Educational Applications. The existence now of PBS 2, C-Span 3, and A&E 2 testify to the success of the Television

Computer in greatly expanding the educational opportunities. Private schools now, maybe public schools later, pay for bulk micro-ads using the streaming info mechanism to get homework assignments out to students. Students can buy memory cards that provide television scheduling and reminding about particular subject matter. C-Span now broadcasts voting records of your particular congressman along with *his* explanation of his record. Of course, the miracle of the Television Computer is that the "Monitor my Senator" application is there only if the viewer wants it.

Randy introduced the group to the President of the Weather Channel. He explained their mission and asked how the Television Computer Channel worked with the weather people. He was aware that a large number of apps existed that used Weather Channel info.

"I would not be candid if I did not admit there have been many difficulties in fitting the Weather Channel's mission in with the mission of Television Computer. In some sense we could have taken the option of putting all our data through the Television Computer digital stream. We do maintain a good fraction of the TC traffic for such apps as our Weather On Demand. The advertisers actually like their product mentioned in TC Weather info. In fact, people with TC*'s get product logo and all."

"However, the TC has motivated us to alter our format to one that uses our video channel for weather news and weather explanation. It is still not practical to predict more than a couple of days in advance. Furthermore, even though viewers can now know within a minute of the occurrence of rain at their location, they remain interested in the larger weather picture in planning trips."

"*I have to admit, however, that much of our programming revenue now comes from advertising our highly effective TC apps."*

Vernon asked, "What do farmers say? Do you have any input from the farming community?"

"Yes, we have special apps for farmers. These provide precise prediction data down to the resolution of a square meter. We now provide the most cost competitive LandSat feed. As you know, with LandSat, crop yields can be calculated by inspection. Combined with their own data about crop and location, farmers can accomplish amazing feats of crop yield maximization. The farmers do this with their home television sets and inexpensive TC*s."

To the Future. In the early nineties, people wondered how to use all the channels that cable could provide without filling the channels with senseless video programming. Now the problem is that channel capacity is filled and publishers are competing for higher quality services. This is principally due to the Television Computer since virtually every economic enterprise is enfranchised in a significant and cost effective way. It was thought that broadcast (point to multipoint communications) was a dead, or poor, substitute for universal point-point (telephony). Indeed Mitch Kapoor, founder of Lotus and a computer industry guru, argued that all point-multipoint should be done away with since only point-point had any value. Now people see that broadcast is perfectly sufficient and desirable in a large number of applications. Point-point telephony requires a person to be an active participant, while broadcast creates a robot servant.

Chapter 6
Creating Info

Marilyn was amused when Randy, her husband, told her how much more he was learning about the TC. Her husband, the TC fanatic, was now getting paid to feed his fanaticism. She told him that the only person in the family who had not gone crazy with this thing was Anne. She had that idea with finding the poodle, and then stopped.

The church youth organization met that Thursday to discuss providing a service to the community.

"Lets use the TC," said Jim.

Anne got upset. It was bad enough that her father and brother were TC crazed. Now Jim had turned. "What do you mean?" she asked.

"Well, I have this idea to get some services to the retired community. I know that TCs are on most televisions around. We could canvas people about the kind of info they would like to receive in the area, and tailor the info services. I have an idea to write an app that church members can use."

"Well, Jim, you can write apps. Nobody else here is a programmer. What do you want us to do?"

"I was thinking about an app that lets you indicate the Church related services you would be interested in participating in. Then,

if the Church has a need, like somebody getting sick, that can be announced to people who have agreed to help on that, you only need to make one phone call, not ten. And more, you don't have to have embarrassing conversations. We can call it the Sea Breeze Methodist Church App."

Anne said, "Yea. I have a computer at home. I don't know how to program, but I could provide info for your app. I know you can usually just call the newspaper for short "info spots," but I can act as publisher too. We can save money sending the church calendar to the newspaper by modem every week. I have to type in the church events calendar for Mrs. Bridges anyway."

"But what about the people without TCs and without Cable?" interjected Bill.

Jim replied, "Bill, I can write the app after I get home tonight. That's not hard. One person's TC can notify him to telephone people directly if he has volunteered for telephone helping. I think it might work. Anne, you would move names and phones into some info panels for this?"

"Sure." Said Anne.

Television computer messages are supported by various applications. This chapter describes how information is constructed for broadcast or loading to applications.

Info Programming Requirements

The goal of info programming is to allow information entrepreneurs to participate in television computing. All info is provided by reference to a specific application or a class of applications that the info entrepreneur must have access to in order to accomplish his programming. A particular app, depending on what the app entrepreneur decided, can simply license info entrepreneurs to provide and receive info, or it may require a paid up license from the app entrepreneur. A license can be paid by the phone payment method or by having the cable

company service keep track and provide billing.

That evening Vernon, Randy, and RestaurantsX ate dinner at Pitty Pats Porch in Altanta. Vernon was feeling much better. The talk with the Weather Channel guy had been invigorating. He could see his family back in Russia with that kind of information for their farm. His only task, now, was to get Randy completely involved so he would take over the duties in America.

"Lets go over the next couple of days in Atlanta. We have to be back in L.A. in three days." Said Randy.

Nello stepped in, "OK, tomorrow we meet the detectives on Mr. Williams' murder. Then, the next day, we meet the executives with Television Computer, Inc. Right?"

"Seems right."

When Nello got back to his room, he made a report on his interactive Marriott TC* with his portable pen pad about his restaurant rating. For every restaurant he rated he got a credit from the Economists Restaurant Rating Club. If he put one restaurant in, he could get one out. The info entrepreneur was an Economist at the University of Chicago. It sounded strange, but economists are push overs for a good dinner.

Info entrepreneurs not only need access to the app that will display and manipulate the info, they also need a PC and the Television Computer Info Software Toolkit. On the PC, the following window appears:

```
┌─────────────────────────────────────────────────┐
│                  TC INFO Toolkit                  │
├──────────┬──────────┬──────────────┬─────────────┤
│   FILE   │   EDIT   │   SCREENS    │    HELP     │
├──────────┴──────────┴──────────────┴─────────────┤
│                                                   │
│                                                   │
│          ┌─────────────────────────────┐         │
│          │  Connection Established to TC │         │
│          │     ┌──────────────────┐     │         │
│          │     │        OK        │     │         │
│          │     └──────────────────┘     │         │
│          └─────────────────────────────┘         │
│                                                   │
│                                                   │
│                                                   │
└─────────────────────────────────────────────────┘
```
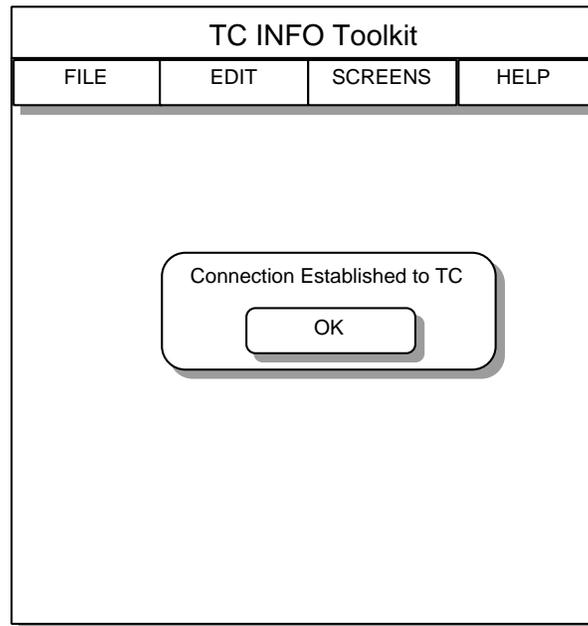
The next step is to load or otherwise have the app running on the Television Computer that is connected by the digital interface to the PC.

```
+------------------------------------------------------+
|                  TC INFO Toolkit                     |
+-----------+----------+------------+------------------+
|   FILE    |   EDIT   |  SCREENS   |      HELP        |
+-----------+----------+------------+------------------+
| OPEN APPS |                                          |
+-----------+                                          |
| NEW INFO  |                                          |
+-----------+                                          |
| OPEN INFO |                                          |
+-----------+                                          |
| SAVE INFO |                                          |
+-----------+                                          |
|   QUIT    |                                          |
+-----------+                                          |
|                                                      |
|                                                      |
|                                                      |
|                                                      |
|                                                      |
|                                                      |
|                                                      |
+------------------------------------------------------+
```
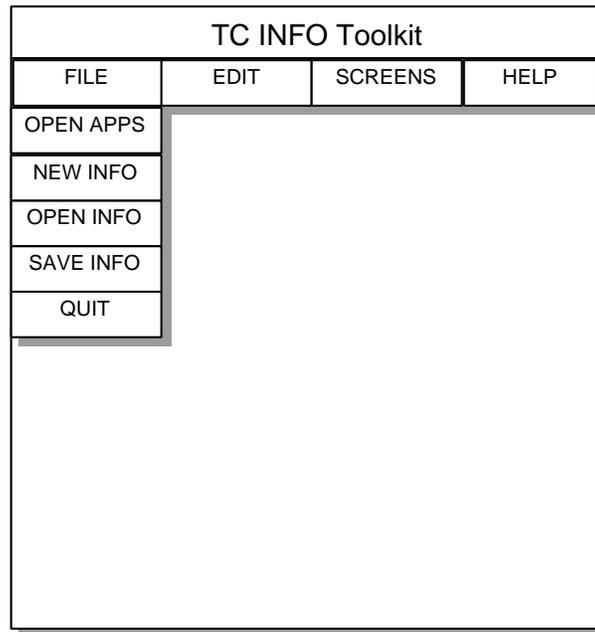
An app must be opened in order to create new info.

```
+------------------------------------------------------+
|                  TC INFO Toolkit                     |
+-----------+----------+------------+------------------+
|   FILE    |   EDIT   |  SCREENS   |      HELP        |
+-----------+----------+------------+------------------+
|                                                      |
|          +------------------------------------+      |
|          |           APPS FROM TC             |      |
|          +------------------------------------+      |
|          | /\                                 |      |
|          |[  ]  RestaurantsX                  |      |
|          |[  ]  Dow Jones App                 |      |
|          |[  ]  App Listing Plus              |      |
|          |[  ]  B's Program Listing           |      |
|          |      Sam's Scheduler               |      |
|          |      Anne's Homework               |      |
|          |      Find a Carpenter              |      |
|          | \/   MAPs from Fred                |      |
|          +------------------------------------+      |
```
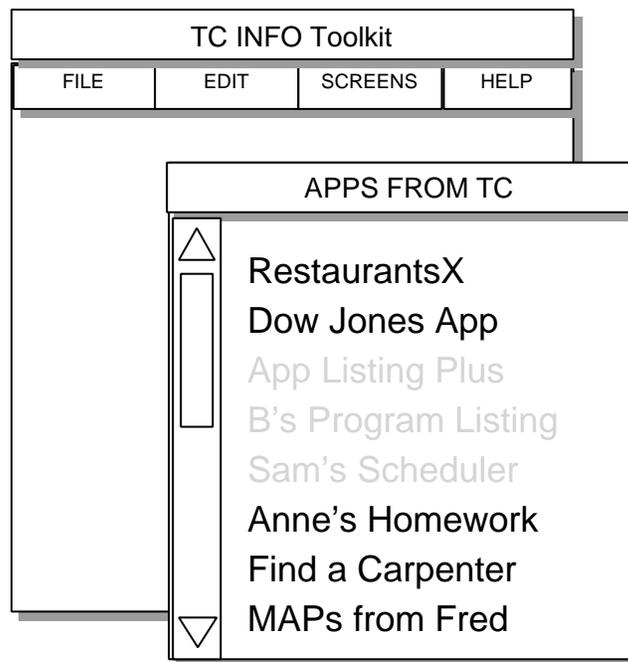
In this example, there are apps listed in light gray that have
info fields defined but that are not licensed to this info

entrepreneur. This info entrepreneur is capable of providing info to Dow Jones. This implies he is a "home supplier." Nevertheless, we consider the case where he selects the **RestaurantsX** app as the one he wishes to edit. He selects the main screen and sees:

```
┌──────────────────────────────────────────────┐
│                TC INFO Toolkit                 │
├─────────┬──────────┬──────────┬───────────────┤
│  FILE   │   EDIT   │ SCREENS  │     HELP      │
├─────────┴──────────┼──────────┤               │
│                    │   MAIN   │               │
│                    ├──────────┤               │
│                    │   NEW    │               │
│         ┌──────────┴──────────────────────┐   │
│         │ RestaurantsX    - 47 Listed      │   │
│         │ Press ENTER for Copyright.       │   │
│         │    Within a mile                 │   │
│         │    Within five miles             │   │
│         │    Within ten miles              │   │
│         │    Within fifty miles            │   │
│         │                                  │   │
│         │       Press PROG to exit         │   │
│         └──────────────────────────────────┘   │
└──────────────────────────────────────────────┘
```
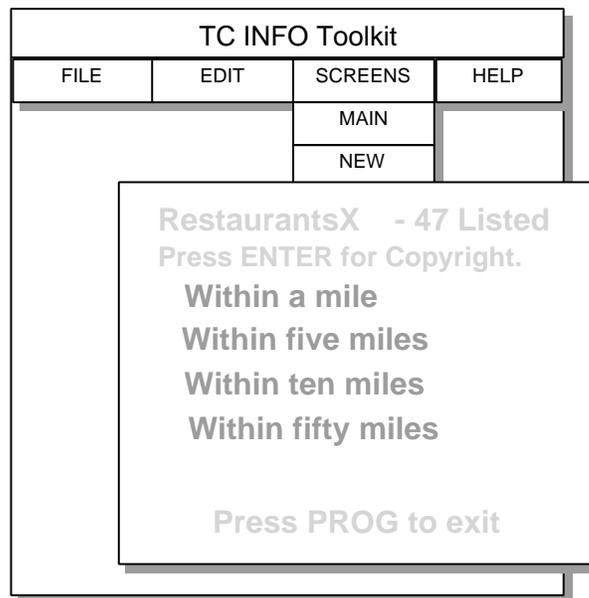
Note that the familiar "Press 1 2 3 or 4" is missing. This is automatically supplied by the TC selections. Selecting any item in this panel brings up the next screen. Each screen can be edited to the extent that the RestaurantsX application license permits it. Light gray, present for PROG, indicates a fixed attribute that cannot be changed. Editing an old entry is possible if it is in black. Below, a single click of the PC Mouse will allow editing "Dorfmanns Deli" and a double click will open it and allow editing the info about Dorfmann's Deli.

```
┌─────────────────────────────────────────┐
│           TC INFO Toolkit                │
├──────────┬──────────┬──────────┬─────────┤
│  FILE    │  EDIT    │ SCREENS  │  HELP   │
│          │          ├──────────┤         │
│          │          │  MAIN    │         │
│          │          ├──────────┤         │
│          │          │  NEW     │         │
│          │  ┌───────┴──────────────────┐ │
│          │  │ RestaurantsX             │ │
│          │  │ Within five miles - 12 Listed │
│          │  │   Burger King            │ │
│          │  │   Catfish King           │ │
│          │  │                          │ │
│          │  │   Dorfmanns Deli         │ │
│          │  │                          │ │
│          │  │   Friday's               │ │
│          │  │                          │ │
│          │  │  Press >> for Next Page  │ │
│          │  │    Press PROG to exit    │ │
└──────────┴──┴──────────────────────────┘─┘
```
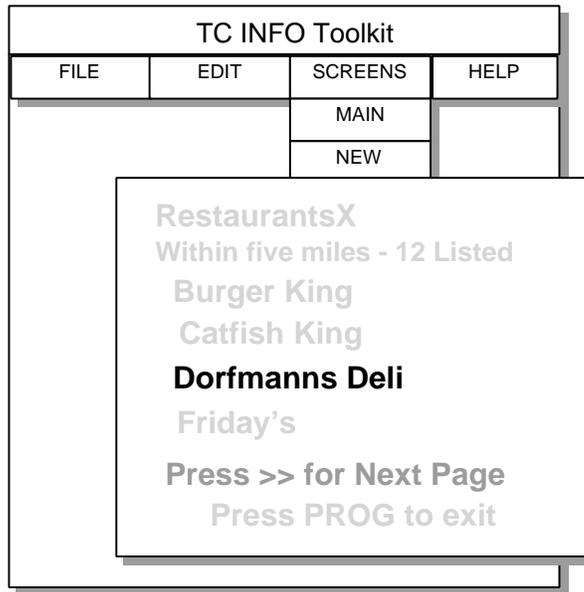
Each text field in the info panel is of a class of text field. In the example above we have the following fields corresponding:

```
┌─────────────────────────────────────────────┐
│                                             │
│   ┌──────────────┐                          │
│   │  App Title   │────────► RestaurantsX    │
│   └──────────────┘        ┌─────────────────────────┐
│   ┌──────────────┐        │ Within five miles - 12 Listed │
│   │ Prev Select 1│──────► │ Burger King             │
│   └──────────────┘    ──► │ Catfish King            │
│                           │                         │
│   ┌──────────────┐        │ Dorfmanns Deli          │
│   │ Next Select  │──────► │                         │
│   └──────────────┘    ──► │ Friday's                │
│                           │                         │
│   ┌──────────────┐        │ Press >> for Next Page  │
│   │ System Note  │──────► │   Press PROG to exit    │
│   └──────────────┘    ──► │                         │
│                           └─────────────────────────┘
└─────────────────────────────────────────────┘
```
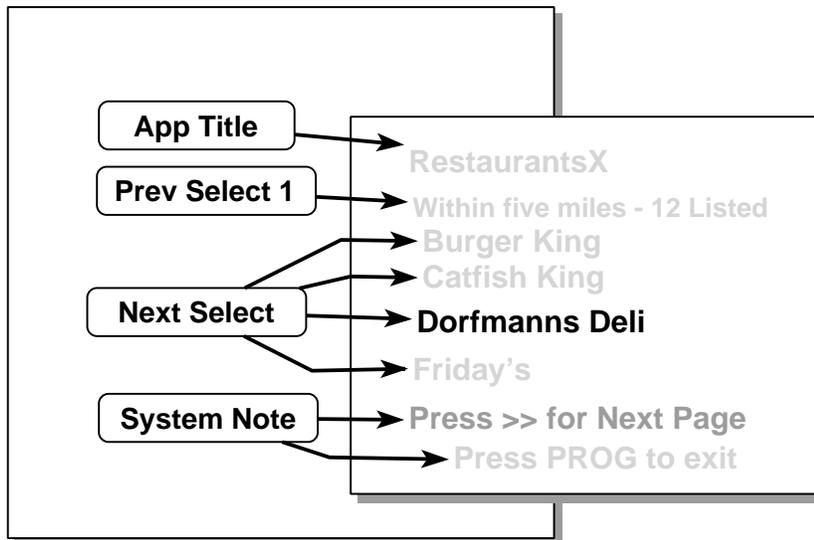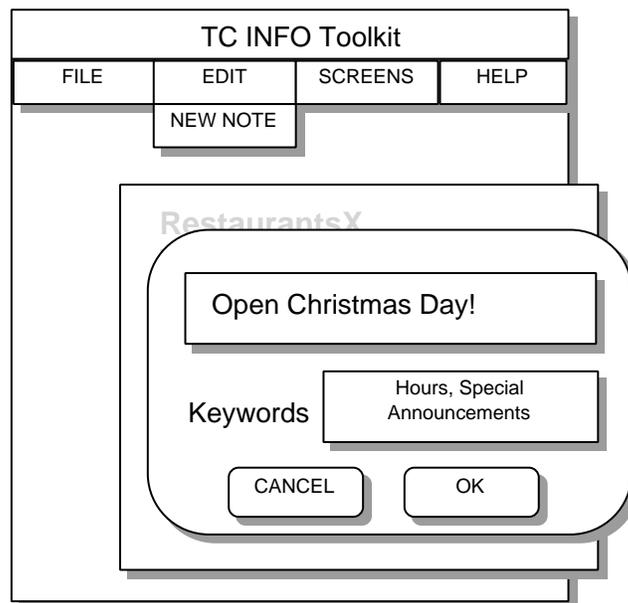
The type of field can be selected and text within a field can have special attributes called "keyword attributes." This can be seen if we look at the text keyword attributes on the Dorfmann's Deli panel:
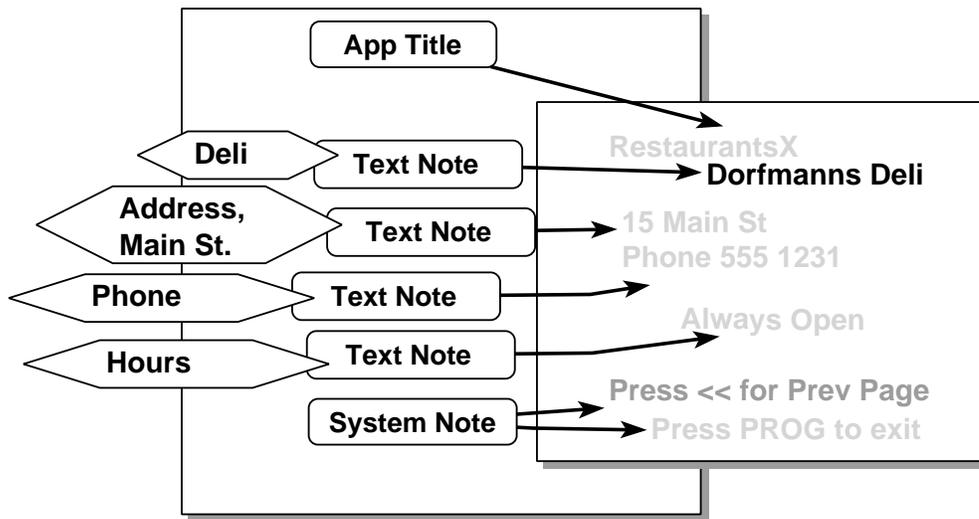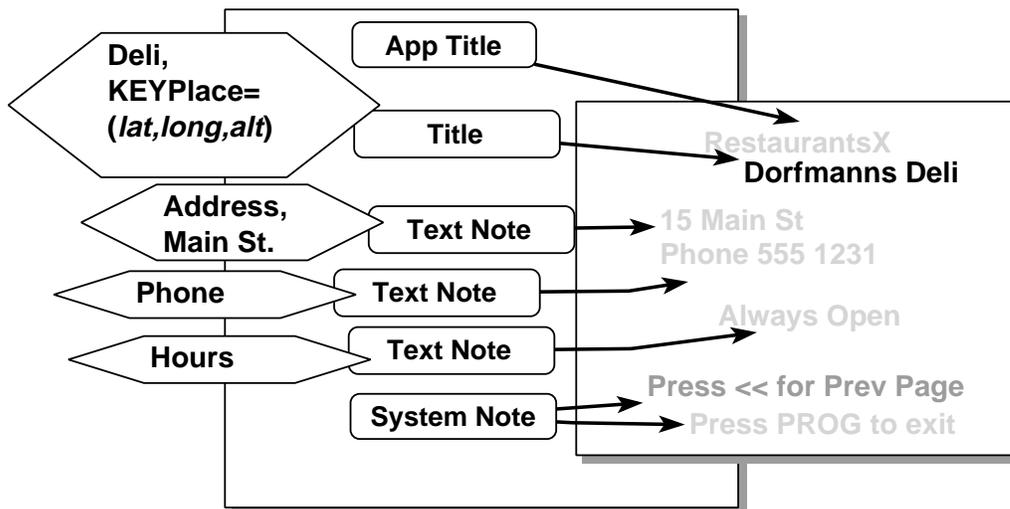
The edit panel allows the creation of a new text note:

After writing the note and indicating "OK" the note appears on the screen and can be dragged around to place it. Once entered, it is possible to show all the keywords for the info in this application.

It is important to note that all of the info creation actions shown above were explicitly allowed by the RestaurantsX application. The programmer of the RestaurantsX application set up the application so that the info entrepreneur could modify the info. The Television Computer software in the PC, TC, and at the Cable Broadcast company injector is all synchronized to do the right thing in terms of minimizing the messages that are broadcast. "Publishing rights" are used to control access to modifications as have been shown.

A clear example of this is the use of the "KEYPlace" predefined keyword for the Dorfmann's Deli text note below.

```
Deli,
KEYPlace=
(lat,long,alt)                App Title            RestaurantsX
                              Title                  Dorfmanns Deli

Address,                                           15 Main St
Main St.             Text Note                     Phone 555 1231

Phone               Text Note                      Always Open

Hours               Text Note
                                                   Press << for Prev Page
                    System Note                    Press PROG to exit
```

This is defined for the app **RestaurantsX** to give the app a mechanism for selecting how near a restaurant is.

The application can create graphics windows for TC* machines in a similar fashion but with more editing capability. This includes the capability to design and color standard background panels, buttons, import images and graphics, and draw geometric objects.

The next morning the three met for breakfast and Randy introduced the subject of the visit for the morning. "We are

visiting Scientific Atlanta. This company provides a good percentage of the hardware infrastructure for cable television in the United States. They produce head ends, satellite communications equipment, cable transmission equipment, and TCs. They have agreed to take us over the entire transport infrastructure. I think they see an opportunity in China."

"Sounds good," said Nello. Nello was not interested.

After two hours of presentation by Scientific Atlanta staff, the topic of info streams came up. "As you know, Teletext and X*Press developed early examples of info streams. In the TC world, the equipment that enables high speed info streaming is special and requires special equipment on the info provider's end as well as the uplink or downlink head end," said Sam Griffin of Scientific Atlanta. "This is particularly useful when Scientific Atlanta is providing special services through alternate data channels."

Vernon's antenna went up. "What alternate data channels?"

"Scientific Atlanta has been providing special video broadcast services for fifteen years. For example, if you are the president of General Motors and you want to give a broadcast to all employees worldwide, we can provide you a video channel. This channel is secure. That is our specialty."

"So you do the same thing with alternate Television Computer Channels," said Vernon.

"Yes. In fact, the cable operator that was killed yesterday, Glenn Williams, brought us some of the first secure TC Channel business four years ago. In fact, I believe he did it for General Motors. Something about a management information system. It is now very common. We now have three secure TC Channels in full operation, 24 hours a day, nationally. I knew Glenn. He was a good person. A bit too slick for my blood though," said Sam.

"Could the Chinese set up secure TC Channels?"

"Yes, with our equipment," Sam grew a bit cold, but business was business. "When the info channel is itself set up to be secure, both because Scientific Atlanta makes the transport channel secure and because Television Computer makes the info secure, customers are much more likely to move a lot of info around." Sam realized what he was saying. He decided to shut up and stick with selling these guys on buying Scientific Atlanta equipment.

Stream Info

It is possible to predefine "info streams" in an application. An application that takes an info stream will request a PC file name for a text file that contains the info. This info stream will print "plain text" on the screen:

Poem of the Day : Kubla Khan

In Xanadu did Kubla Khan
A Stately pleasure-dome decree:
Where Alph, the sacred river, ran
Through caverns measureless to man
  Down to a sunless sea.

Press >> for Next Page
 Press PROG to exit

Info streams can be connected at the cable broadcast injector to continuous data streams such as Dow Jones.

Any data stream, if the application allows it, can take a keyword index stream. As might be expected the application determines whether an info stream accumulates on top of prior

info or whether it overwrites the prior info.

On the drive to the Atlanta Police Department, Vernon said, "lets go to my room tonight and look over the TC products in the L.A. superstore app. I want to have a better handle on the diversity of applications and options on the TC."

"There was an entire section on Educational Apps, I noticed," said Randy. "It is probably just as valuable to China to have television education with such a huge country."

"I think this comes under the category of info apps, in TC'eze," responded Nello.

Info with Queries

The info entrepreneur can be allowed to do many things by the application entrepreneur. A common technique is to use the menu sequence as a query system. The info entrepreneur with the right application can allow the Television viewer to keep notes:

> **RestaurantsX**
> **Dorfmanns Deli**
> **15 Main St**
> **Phone 555 1231**
> **Always Open**
>
> **Your Rating   10**
>
> **Press << for Prev Page**
> **Press PROG to exit**

In this case the rating blinks and the viewer can type in his current opinion (presumably on a 1 to 10 point scale).

The example above is limited to entering a number. With graphics versions of the Television Computer, and with the Television Computer connected, through the toolkit to the PC

keyboard, or with the TC Infrared Keyboard Kit, it is more convenient to input free text if allowed by the app.

Info can be developed for the Television Computer *. This permits fancy color graphics.

Dorfmann's Deli
Always Open

Stanton

I-92

15 Main St
Phone 555 1231

RestaurantsX   **<<**   **X**
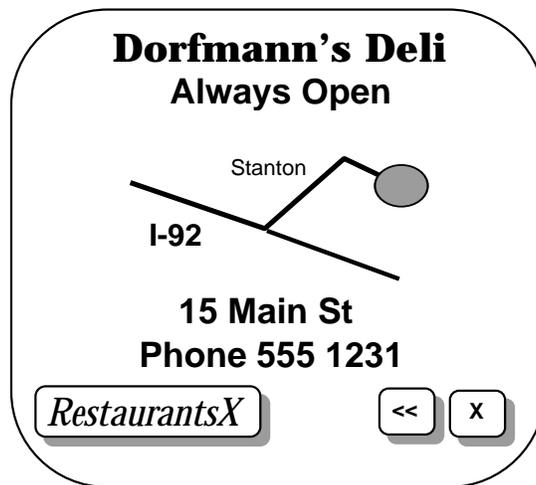
Combining the capability to display graphics with the capability to accept user input, the TC supports a large variety of home shopping services. The INFO Toolkit is not powerful enough to allow writing an interactive information exchange back to a central clearing house. This requires the app toolkit.

Chapter 7
Creating Apps

Vernon met the detective, Michael Crenshaw, to see what progress had been made on Mr. Williams murder. Michael told him there were four suspects being examined at that point. In one case they had monitored an Iranian group that claimed responsibility. Basically the Mid Eastern states wrote about the murder in their newspapers as a justified act.
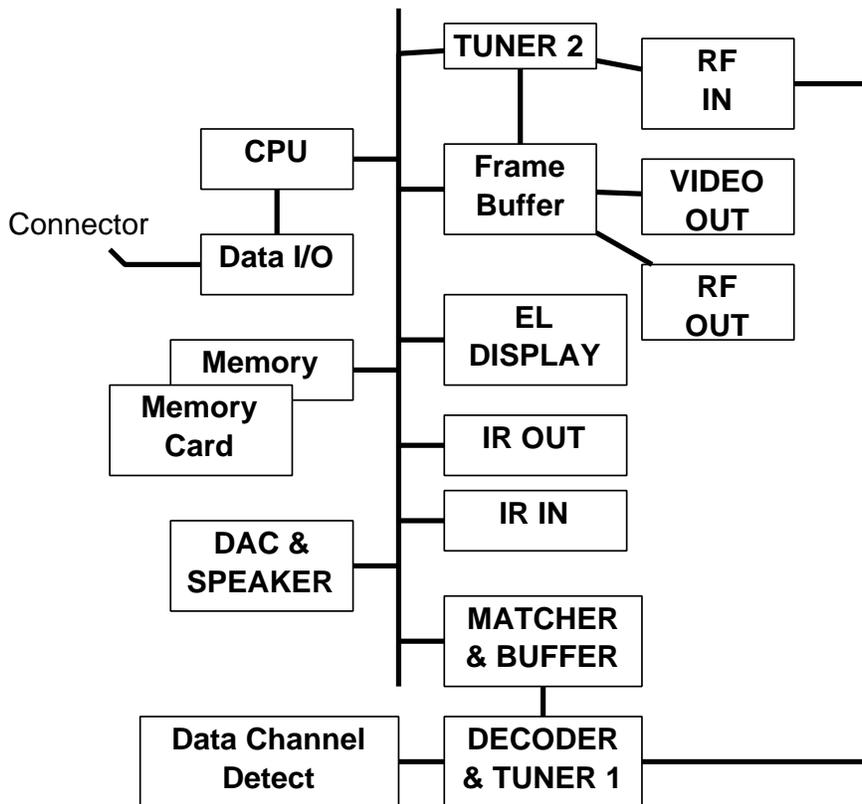
The problem was to attract the right interests and solve the murder. The detectives had the idea of a "Who Killed Mr. Williams" app. The murder was world news. This app would be available internationally. Again, you had to pay for the app and the app solicits information pertaining to Mr. Williams' possible murderers. That information would then become available to the community of people running the "who killed Mr. Williams" app. The guess was that the information would snowball and pretty soon people would be getting a good idea of who killed Mr. Williams. "The murderer would have to be one of the subscribers," Officer Crenshaw said, "because he wouldn't dare not be a subscriber."

Vernon's concerns about the TC increased. He worried that the TC in the hands of a totalitarian regime could be used to start another 'red brigade' movement. Clearly apps, as well as info, would have to be controlled. "But how can China protect itself against its own leaders?" He wondered.

This chapter describes how software applications (or, more literally, computer programs) are written for the television computer.

The applications environment is defined partly by the TC hardware specification.

Television Computer Hardware Schematic

```
                              ┌─────────┐    ┌────────┐
                              │ TUNER 2 │    │  RF    │
                              └─────────┘    │  IN    │
         ┌─────────┐                         └────────┘
         │   CPU   │          ┌─────────┐
         └─────────┘          │ Frame   │    ┌────────┐
 Connector                    │ Buffer  │    │ VIDEO  │
         ┌─────────┐          └─────────┘    │ OUT    │
         │Data I/O │                         └────────┘
         └─────────┘                         ┌────────┐
                              ┌─────────┐    │  RF    │
                              │  EL     │    │  OUT   │
         ┌─────────┐          │ DISPLAY │    └────────┘
         │ Memory  │          └─────────┘
         └─────────┘
       ┌──────────┐           ┌─────────┐
       │ Memory   │           │ IR OUT  │
       │ Card     │           └─────────┘
       └──────────┘           ┌─────────┐
                              │  IR IN  │
       ┌──────────┐           └─────────┘
       │ DAC &    │
       │ SPEAKER  │           ┌─────────┐
       └──────────┘           │ MATCHER │
                              │ & BUFFER│
                              └─────────┘
   ┌──────────────┐    ┌──────────────┐
   │ Data Channel │    │  DECODER     │
   │ Detect       │    │  & TUNER 1   │
   └──────────────┘    └──────────────┘
```

A computer or CPU is attached on a data bus or path to the other components. These include memory and the memory card. Two television tuners, one for the digital data channel and the other for the normal video channel. There is an "EL" (electroluminescent) display, and infrared remote (IR) input and output circuits. The "DAC" is a 'Digital to Analog converter' that is also the basis for 'digital audio' on cable. However, the speaker is used for alarms and warnings and so this DAC is a pretty simple one that does not provide high quality stereo.

The applications programming environment is set up to provide a general purpose programming environment enhanced in various ways to support writing applications specific to the device and specific to the needs of the app entrepreneurs. It includes several classes of objects:

objects for application classes (app.objects)

objects for monitoring the broadcast channel (channel.objects)

objects for the user interface (interface.objects)

objects for messaging other applications (message.objects)

objects for system inquiry (system.objects)

The object programming language is based on C++ and incorporates features for multiple class inheritance. Various other languages that have been provided basically produce C++ code that is then compiled by the TC compiler.

The system provides certain applications, such as the INFO manager and the APPS manager (that execute when the corresponding buttons are pressed on the TC remote control). There is a Windows manager, a Data Channel manager, a TVControls Manager, a Digital Interface Manager, and a primitive file system. These managers are of the form of app servers. Each application must, in general, own its own file system for messages (INFO). There is no construct for archival storage (for example, reading and writing from disk) although a device server attached to the digital interface can cause a dump of any named app or info to that device, and some TCs have swapping disks that expand the non-destructive memory.

Using the VCR for app and info storage is possible with any Television Computer. When the RF input of the Television Computer is connected to the VCR RF output, the Television

Computer can find the data channel (in this case either 3 or 4) and fix on it with a VCR reading app. The title of the info or app being loaded is displayed while it is being loaded on or off the VCR.

The operating system model is derived from MACH in that it provides for threads, messages, multitasking, and virtual memory. However the version of MACH is rudimentary in many respects. For example there is no keyboard support. MACH is from Carnegie Mellon University and is the same operating system that is the basis for Microsoft Windows NT on the PC, NeXTStep on the NeXT machine, and OSF1 on DEC, HP, IBM, and a variety of others.

The following discussions are not complete but they sketch the programming model.

App Classes

The app classes include a basic class that knows about the basic app characteristics. This includes the private authentication code and the resource utilization of the app. The Actuator app is one that can operate the *privileged* TV Controls. This app is the one that cannot be broadcast without governmental approval, but it can be run on a local Television Computer. The Graphics app is one that makes use of the frame buffer. Declaring an app of these special built in classes automatically puts the "!" or "*" in the app name.

```
        Basic App
       /         \
  Actuator      Graphics
    App           App
```
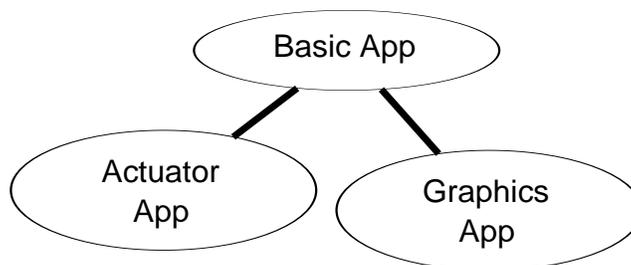
These are the app classes provided by Television Computer, Inc. Any app provider will tend to provide new app classes in order to control info authentication. He can publish a means to allow info entrepreneurs or other app entrepreneurs to take an instance of his particular app class. A characteristic of any Basic

app is that it can, or cannot, be employed to generate an object class subsidiary to it. For it to do this, it must run on a TC and the PC must request class confirmation.

Vernon walked up to the Television Computer Building main entrance. It was a thirty minute drive north east of the city of Atlanta and they had passed the main entrance to Scientific Atlanta on the way. Both Randy and Nello were still rumbling around in the trunk of the car for something. He would have to wait another few minutes. He went on in and signed himself in. He told the receptionist that they had a meeting with the President, Mr. Whitaker.

President Whitaker's personal secretary came down to meet the team and escorted them to the meeting room. In the room were four other people. Two had "International Development" on their cards. Another was listed as "Economist" and a final person was listed, Bellcore-like, as "Member of the Technical Staff." They sat down and Mr. Whitaker asked, "Gentlemen, what is this about?"

Vernon spoke, "We represent the Chinese Chamber of Commerce. Basically we are an advance planning team whose job is to write a report on how the Television Computer might find its way into China."

"There are obvious problems." Said Nello.

The TC economist agreed, "The Television Computer is fundamentally a device for free-world capitalism. It is hard to see how to make it work on a large scale in a non-capitalist or a totalitarian country. You know this guy Glenn Williams? He tried."

"What is difficult, from an economic perspective, is that the Television Computer is designed to be a slave. This does not play well in a communist society. The people have to be able to make money by individually controlling information flow. How can we make the Television Computer work in a communist, non-capitalist, totalitarian society?" Asked Nello.

"This is getting a bit thick." Responded Randy. "I think the answer is that the Chinese central facilities would program all the apps for the population and thereby would control the info. Can Television Computers be set up to prevent the participation of people in writing apps?"

The technical guy said, "No."

"Why? It seems like they could."

Vernon, by now, was entranced with Randy. He was beginning to sound like a good communist. Randy would be the person to replace him. He had the organization skill and the ability to sound good to the Chinese. Then came the bomb.

"Gentlemen," said Mr. Whitaker. "It seems this discussion is moot. The Television Computer is already in China. Nathan, can you explain? Nathan is our head of international development."

"Remember this cable guy Glenn Williams? Two years ago he came to us and arranged a satellite feed. Over 20,000 Television Computers are installed. Chinese are probably writing apps and info today. The equipment was underwritten by a Russian philanthropist."

Vernon thought, "Oh my God."

Nathan continued, "The Russians have been building inexpensive television sets for the Chinese right? Well they have also been sticking in TCs. Are you sure you are from the Chinese Chamber of Commerce?"

Vernon interjected, "What use is being made of these?"

"It is really none of our business. We thought you would have known."

"No. But the number of units is small enough that it probably does not matter. Our job is to plan a trade visit, not be the trade visit. Let's get back to the infrastructure requirements," Vernon successfully got off the subject.

Channel Monitoring Classes

The Channel Monitoring Classes are distinguished between app and info monitors, and between clocked and random monitors. In order to understand how to write Channel Monitoring objects it is necessary to understand a little bit of the channel monitoring scheme. Channel monitoring is done by a layered filter that includes a match list at every step in the filter. The filter layers are shown below:
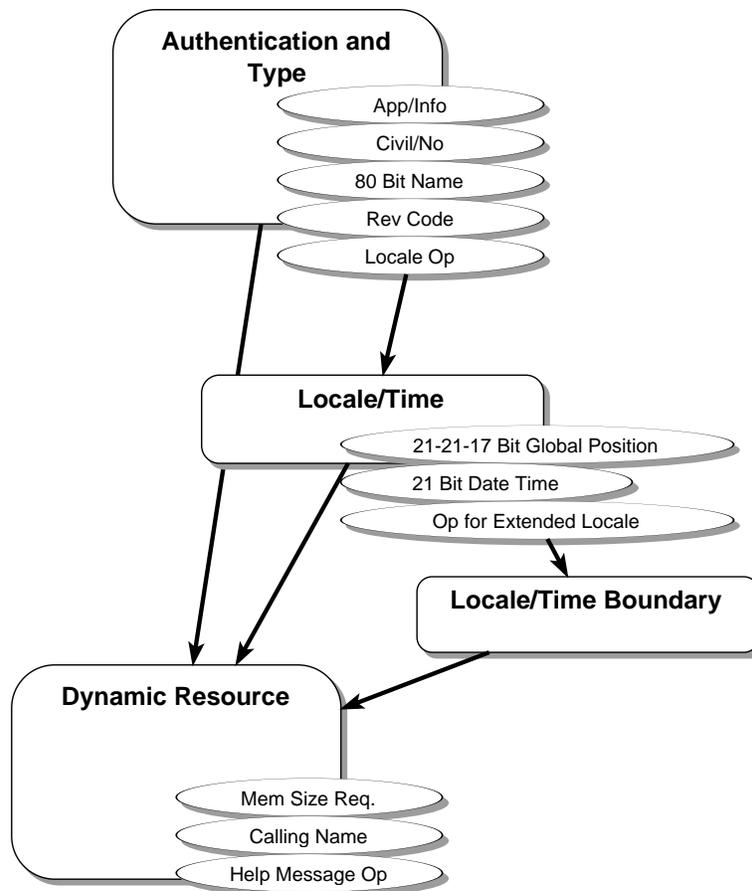
Basically a request is made for a particular application or info

object that is authenticated by an 80 character code. Provision is made for a governmental object that *must load* regardless of whether it is expected. If there is a locale operation, this is tested before the dynamic resource test is performed. If there is not enough memory to accept the app or info, an attempt is made to load it in spare space and a message is put to the viewer that he needs to discard an app.
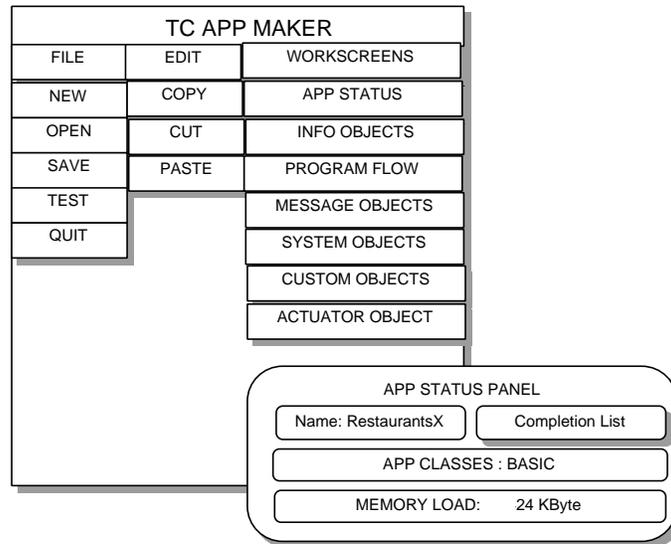
Other forms of authentication can be called by the author of the program on whatever data structures he defines for this purpose. The locale construct is a stricture on where and when this app or info can be loaded. More complex locale boundaries than simply a location in space and time with plus or minus bounds must be made by specialized versions of this object. These can apply after the app or info is loaded.

Vernon was getting very nervous. "Do the Chinese people already have the ability to make their own apps?"

"Guess," said Nathan.

TC App Maker

The TC App Maker software on the PC works similar to the TC Info Toolkit in that authorization to create an app, or to alter an existing app, is provided by a licensing scheme established by a PC-to-TC digital connection. Anyone can create a basic app. A basic view of the TC App Maker menus is shown below:

```
┌─────────────────────────────────────────┐
│              TC APP MAKER               │
├──────────┬──────────┬───────────────────┤
│  FILE    │  EDIT    │   WORKSCREENS     │
├──────────┼──────────┼───────────────────┤
│  NEW     │  COPY    │   APP STATUS      │
├──────────┼──────────┼───────────────────┤
│  OPEN    │  CUT     │   INFO OBJECTS    │
├──────────┼──────────┼───────────────────┤
│  SAVE    │  PASTE   │   PROGRAM FLOW    │
├──────────┼──────────┼───────────────────┤
│  TEST    │          │  MESSAGE OBJECTS  │
├──────────┤          ├───────────────────┤
│  QUIT    │          │  SYSTEM OBJECTS   │
└──────────┘          ├───────────────────┤
                      │  CUSTOM OBJECTS   │
                      ├───────────────────┤
                      │  ACTUATOR OBJECT  │
                      └───────────────────┘

        ┌──────────────────────────────────────┐
        │          APP STATUS PANEL            │
        │  ┌──────────────────┐ ┌────────────┐ │
        │  │ Name: RestaurantsX│ │Completion List│
        │  └──────────────────┘ └────────────┘ │
        │  ┌─────────────────────────────────┐ │
        │  │     APP CLASSES : BASIC         │ │
        │  ├─────────────────────────────────┤ │
        │  │  MEMORY LOAD:      24 KByte     │ │
        │  └─────────────────────────────────┘ │
        └──────────────────────────────────────┘
```

The method of program creation is to name a new app and assign it to a known class that is confirmed through the digital link to the Television Computer. In the above example, the app Status indicates that the Basic app class is the class for the RestaurantsX app. The programmer always knows the memory load he is putting on the TC.

The method of programming is to create objects and then to link objects in a process flow diagram. Message objects link different apps with messages. This link includes broadcast messages and messages passed between apps on the TC. INFO objects are provided with a call to the INFO Toolkit. INFO objects are organized in a strict hierarchy of INFO screens. The INFO object in this system is similar in spirit to User I/O in PC and workstation schemes. Finally the custom object is the place for custom code.

"I imagine that the Chinese Chamber of Commerce knows about this already," said Nello. "They are much more interested in a legalized use of the TC in their country. With such use they can get the service out to many more people. The value in

protecting lives and investments must be great."

"Don't count on it," Vernon thought to himself.

Raw Code.

It is possible to program the TC using more common programming languages. Below is an example of the Tornado Warning App (with "stubs" for the secret code) written in the programming language Modula-3 (courtesy Dick Orgass, Carnegie Mellon University). It is based on the following objects:
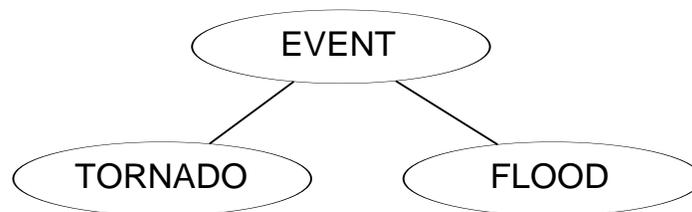
Each of these objects is defined in a Modula 3 INTERFACE:

```
INTERFACE Event;
  IMPORT Position;
  TYPE
   T = OBJECT
    location: Position.T := NIL;
    time: Time.T := Time.Epoch;
   METHODS
    isInteresting(myLocation: Position.T):BOOLEAN;
    action(myLocation: Position.T);
   END;
  PROCEDURE Handle(e: T);
  (* The general purpose event handling procedure. *)
END Event;

INTERFACE Tornado;
  IMPORT Event, Position;
  TYPE
   T = Event OBJECT
    id: CARDINAL := 0;
    data: Data := NIL;
   METHODS
   OVERRIDES
    isInteresting := Interesting;
     action := Action
   END;
   Data <: REFANY;
  PROCEDURE Interesting(self: T; myLocation: Position.T): BOOLEAN;
  (* Returns TRUE if this Tornado is of interest to me and FALSE otherwise. *)
```

```
  PROCEDURE Action(self: T; myLocation: Position.T): BOOLEAN;
  (* Does the appropriate thing for the Tornado T at this location.  *)
END Tornado.
```

INTERFACE Flood;

```
  IMPORT Event, Position;
  TYPE
   T = Event OBJECT
     id: CARDINAL := 0;
     data: Data := NIL;
   METHODS
   OVERRIDES
     isInteresting := Interesting;
     action := Action
   END;
   Data <: REFANY;
  PROCEDURE Interesting(self: T; myLocation: Position.T): BOOLEAN;
  (* Returns TRUE if this Flood is of interest to me and FALSE otherwise. *)
  PROCEDURE Action(self: T; myLocation: Position.T): BOOLEAN;
  (* Does the appropriate thing for the Flood T at this location.  *)
END Flood.
```

INTERFACE Position;

```
TYPE
 T = REF RECORD
   latitude: Latitude;
   longitue: Longitude;
   altitude: Altitude
 END;
 Latitude = BRANDED [-180.0..180.0];
 Longitude = BRANDED [0.0..360.0];
 Altitude = BRANDED [-1000..36000];
PROCEDURE Here(): T;
(* Returns the current location of the Box. *)
END Position.
```

A Modula 3 MODULE defines a program or application.   The numerical computation that decides whether a Tornado or Flood is interesting is hidden in this example

MODULE Event;

```
PROCEDURE Handle(e: T) =
(* The general purpose event handling procedure. *)
  VAR here := Position.Here();
BEGIN
 IF e.isInteresting(here) THEN e.action(here) END
END Handle;
BEGIN
END name.
```

MODULE TornadoWarning EXPORTS Main;

```
IMPORT Event;
```

```
PROCEDURE Next(): Event.T;
(* Each time it returns is return value is another event.  *)
WHILE TRUE DO Event.Handle(Next()) END;
END TornadoWarning.
```

At least forty companies have introduced programming toolkits based on other programs and programming methods. This was made possible because Television Computer, Inc., licenses access to the Television Computer objects through standard library protocols.

It was clear from the afternoon meeting that Television Computer, Inc., would be happy to work with the Chinese delegation. However, Vernon was not sure he wanted his Chinese employers to hear what he heard. Then he got an idea. "Do the Russians need somebody to establish a working relationship with the Chinese Government?"

"We can put you in touch as long as the people can stay anonymous, I think," said the other international development guy.

"This guy has a Russian accent," thought Vernon. Then he said, "It is properly the role of the Chamber of Commerce to establish such a connection. I would want to visit Russia at some point." He decided that was as far as he was going to push it for now.

Randy said, "Would Television Computer create a version of their system that prevents other people from writing apps for it?"

"No," said Mr. Whitaker. "We cannot in principle stop this from happening. The architecture of the Television Computer prevents us from eliminating the possibility of writing your own apps. We would not do this in any event."

Vernon was now thinking about 'the Chinese television computer' as a joke. He could imagine the Chinese making a Chinese copy of the television computer in order to avoid this

particular problem.

Randy, for the first time, now realized the position he had been taking. He realized that he was perhaps accepting too much of China's communistic interests.   He interjected, "Good, Mr. Whitaker. I was hoping you would say that. I have always found the openness of the TC to other people's programming its most attractive feature."

Vernon was even quieter.   He realized that Randy's own nationalism was starting to surface. "This would be all right," he thought.   "The follow up Chinese delegation would only need Randy to organize meetings."

"It is simply our policy," said Mr. Whitaker.

After another hour of discussions and some demonstrations of the head end equipment and some of the new software, the group left.   The plan was to head off to L.A. the next morning. They had a meeting with a guy who was a power user of TCs.

Graphics and Interactivity.

Graphical programming that uses the TC* instead of the basic TC is extremely simple from a programming point of view.   The objective of the TC* is to allow high quality color digital pictures to be displayed. This requires that every pixel in the display be addressed separately and that enough pixels or picture elements be used to show as much detail as the TV is capable of showing clearly. This is about 250,000 pixels in the standard TC*.

A part of the memory of the computer is set aside as display memory.   Display memory can overlay the live video with transparency.   Each byte (8 bit computer word) has one corresponding pixel on the screen. If all the bits are 0, the live video pixel for the currently tuned channel comes through. If any bit is not zero, any one of 255 colors will be displayed for the pixel. Each color actually selects any of 256 red, green, and blue values. This technique is well known to produce photographic quality images. The Kodak Color App is a server app available

from Kodak that is known to do the finest job of color matching in critical situations.

Any pixels or combination of pixels can "leak" the video through. This means it is possible to achieve video effects like titling on the tuned channel. This is used to allow the TC to write text or graphics on any channel tuned. The system will "blue screen" the video values if a cable channel is not tuned.

The difference between the TC* and the TC is that the TC is simpler. It uses fewer pixels (about 120,000) and each pixel is only 2 bits instead of 8. Transparency by the second bit is still possible and the blue screen feature is still supported.

Writing text on the screen uses the font object provided in the applications kit. The font object guarantees that a font on a TC looks similar to the one on the TC* and that both can display the font.

Graphics, though, is generally supplied by companies other than Television Computer.

The provisions for interactivity include the use of a cable back channel and telephone modem support through the digital port. In any case the programming model is that of defining a server app for accepting infrared remote input and another one for writing to the desired device. The programming toolkit provides a powerful infrared programming model. This is based on an in depth analysis of possible remote signals and a recognizer that matches any observed remote pattern against a standard or special database. The infrared remote service utilizes about 25 kilobytes of memory.

The toolkit also provides a number of facilities for writing to the cable back channel or accessing a read/write port through the digital interface. Every TC can maintain a collection of telephone numbers available to other apps for use. A common app distributed free by the cable companies is the "Telephone

Directory App" that allows the owner of the TC to view and modify this central list of telephone addresses.

On the ride to the airport to take the flight to L.A., Randy told them he had a surprise. Everybody needed to get out his personal floating TC memory card and have it on the plane. Vernon did not have one, but he did have the card that Marriott had given him for his Marriott accommodations.

He said, "Will this one do. I did not bring my floater on this trip."

Randy said, "Hell if I know."

"Ditto," said Nello.

"Well, what's the deal anyway?" said Vernon.

"Wait until you get on the plane," said Randy. He switched to talking about the Atlanta skyline. When they got to the airport on on board of the plane Vernon saw the surprise. For every seat on the airplane there was a flat panel color display and a little slit for a memory card. Delta had equipped the entire Boeing 777 with TC*s.

"Wait until you see the apps," said Randy. Each display had an attached keyboard beside it. There was no remote control, but the keyboard was the recognizable TC keyboard. Randy and Nello had both already plugged in their floating TC cards.

Vernon pushed the APPS button. The app listing showed the apps that Vernon might have expected. There was the Emergency Instructions App, In Flight Programming App, and the Plane on Map App. He selected the Plane on Map App. It showed the plane stationary on Atlanta Georgia. He figured it would show where they were and what was outside the window while in flight.

He pressed the APPS button again and jumped back to the apps listing.   Then there were some other apps.Randy

interrupted, "I don't know whether you noticed but we each have our own TC here."

Vernon looked and saw an app, the Inside Plane Talker App. He pressed button 4 to select it. He got a screen that gave him the option of help or to read his identification off a memory card. He slipped in the Marriott card and display showed his name a Marriott name for his floating TC, "Marriott432A," and some of the apps that he had loaded in the motel. This included the Spiegel Catalog app.

"I can play with this," thought Vernon."The Plane Talker App let Vernon post info to the rest of the people on the plane and let him get some rudimentary filters. He could start an app that looked for rides out of L.A. International Airport.

"It even knows where we are going to," Vernon thought. Like the regular TC, no one knew who the other guy was until both had agreed to communicate.

The intriguing one was the Find Fellow Foreigner App. He ran this and selected "French." Vernon had a few ideas. He published his selection. The screen showed the familiar blue dot, so he pressed INFO. The message said "fellow Frenchman found. TC name QualityInn8A65R." Confirm whether you wish to be known.

He decided to ignore it. Evidently so did the other 'Frenchman.' The TC took over with the instruction to fasten seat belts. After it let go, he switched a movie to vegetate on TV."

Chapter 8
Getting Started

When Randy called Stan Coryn to set up a meeting with his division of Time, Inc., Stan suggested that they not bother with him. "I know who you should talk to." He said, "You should talk to a friend of mine who is really deep into watching TV." Randy took his advice.

Steve had bought every new television device since he moved from New York to his house in the canyons of Hollywood. His entertainment room stretched out with a giant horseshoe sofa and a huge coffee table meant for gadgets, feet, food, and drink. A large screen and six smaller screens were bordered by two vertical columns of VCRs, Tuners, TCs, Frox Boxes, and other devices. Steve's seat was positioned precisely for a highly directional microphone. He could direct the action by ordering it: "Turn on the main screen and get me HBO West. Put Sam on the video phone on screen one. Monitor the driveway on screen four." Then a TC "woke up" and posted a message on screen 2: "Meade Telescopes has just introduced a 20 Inch Computerized Telescope and will install on TCs anywhere in L.A.." Steve figured to be able to show Saturn live.

Steve's maid fixed sandwiches for everybody. Vernon walked outside. He stood next to the pool with a view of Steve's tennis court. The side of the hill had an artificial creek going down it. Steve said he had just paid a quarter of a million dollars having

the hillside up the canyon wall replanted. Steve and Vernon climbed the stairs up beside the creek to look down on the compound and the adjacent manors. Steve lived alone. Vernon thought to himself, "So this is Hollywood."

Randy came up, "I love what you have done with your TCs. Have they affected your life?"

"I have been trying them out to strike up parties among the neighbors lately. Its been fun," said Steve genuinely.

"Let me guess," said Vernon. Then he paused, "You know, I can't guess. What do you do?"

"There is an LA Party Maker app," said Steve. Randy knew this app. "I can publish info to people who want to have parties and who live right around here. It works fine. They have to call me to rsvp. Its fun."

This chapter describes how the economy got off the ground and something of the future by the year 2004.

Where the idea of the Television Computer came from.

The story began with the HDTV (High Definition Television) conferences held at the Defense Advanced Research Projects Agency (DARPA) in late 1988 and early 1989. One of these meetings had Mr. Darman from the White House calling every few minutes on the stand President Bush should take concerning commercial electronics industry support. This author, at that time, decided that a significant contribution could be made, not by developing a new material, manufacturing process, or display, but by repeating a revolution in computers brought about by the introduction of operating systems. These systems are software that handles the software written by others. They provide a basis for machine independence, and, it was later discovered, they provide a basis for having several programs run at once. This so-called multitasking attribute, along with device independence, could revolutionize television.

One consequence of that meeting, and probably some others, was that Craig Fields was relieved of his responsibilities. He was acting against the White House on his belief that commercial electronics were in the national strategic interest. Of course, the Japanese, Germans, Russians, Chinese, and others have seemed to realize it was in their national strategic interest!

Another result was the idea mentioned in the first chapter:
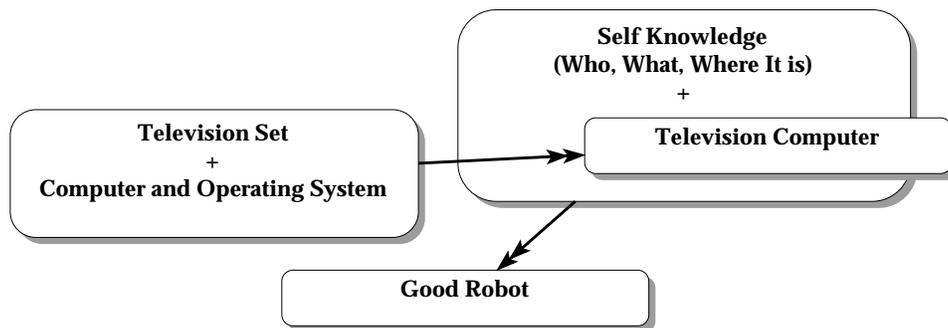
The idea, interestingly, came out of a desire to figure out what makes for a good robot. In this case, a good robot is a television that does what you want it to do, and constantly improves. It seems the way to bring this about is to allow anybody to program it. Let everybody participate in improving the system.

This idea was the antithesis of other ideas about videotext, video games, video information devices, video mailboxes and the like. It said that rather than try to decide up front what makes the television work, do what the computer industry did: enable anybody to participate in the improvement. A computer programming language has what is called the power of a Turing Machine. This means that the application running on the computer can mimic any physical device imaginable. The objective, then, is to let everybody participate in imagining good things for TV.

If the computer knows certain things about itself it can behave as a good robot. It can do good things without being asked to do them.

Using Local Entrepreneurs to Protect Commercial Electronics

About a year and a half passed as a petition was made to DARPA for funding the effort to port an operating system, CMU MACH, to intelligent broadcast display devices. Most people did not think much of this idea. This was similar to managements response to the inventor of the television tube, an American, Vladimir Zworykin

Peter Brody, the inventor of the flat panel active matrix LCD Display, has retained a newspaper clipping of Vladimir Zworykin's words:

LOS ANGELES --(Associated Press 1973)-- Vladimir Zworykin, who invented the television picture tube 50 years ago, says his favorite part of a TV set is the switch.

Zworykin, who was 85 yesterday, deplores the number of crime and murder stories on TV.

"When broadcasting began to develop, I hoped TV would be used for educational purposes, especially so that different cultures could learn to understand each other. Instead, most of the times when I turn on the TV -- bang, bang, bang," Zworykin said during a pre-birthday celebration at a local restaurant Monday night.

He lists wildlife shows, political debates and news programs as his favorite TV fare.

The Russian-born inventor was working at Westinghouse Laboratories when he demonstrated the first workable TV model in 1923.

"When the head of Westinghouse saw the first TV he said, 'Put that guy to work on something more profitable,'" Zworykin recalled.

He still acts as a consultant to the RCA research center in Princeton, N.J."

Vernon faxed Lian word of Whitaker's disclosure of TCs already in China. He asked for specific instructions about what he should do next.

A shiver went up Lian's spine on reading the fax. She realized TCs could exist in China if other elements of the government were involved. This meant a powerful faction of the inner circle of communists would be involved. She went to her superior.

"Yes, we know of reactionary forces who have been using the TC." said Chow. "A Russian is financing them and an American is orchestrating the arrangements. We know who both of these people are and we are taking the appropriate actions to stop them. Our actions will send a message to our communist brothers."

Lian realized one of these people, the American, had already been made and terminated. Lian asked, "Should I continue with our advance planning group in America? Are we still to form the trade delegation for the TC?"

"Yes. Our next action is to make these Television Computers available to all party members. Whatever information is now available to the privileged few will be made available to the majority of the party." Chow, or more probably his superiors, intended to fight fire with fire.

"I have never heard of Television Computers in China," said Lian. She was hoping that Chow would elaborate.

"Our cadres have been circumvented in several provinces. We find food supplies choked when our leader overrides the opinions of one of the traitors. Worse, information about such situations leaks out and becomes conversation. We monitor all phone traffic and fax traffic but we were not looking inside the television transmissions. We are now." Chow paused and then said, "Please get back to your responsibilities."

Lian provided a fax back to Vernon, "Vernon. Thank you for the information. Proceed as agreed." Lian would never tell Vernon what she knew. He deserved to get back to Russia. It had to be better than China. Vernon's wife and children deserved a better life too.

Peter Brody, like Vladimir Zworkin, saw his technology sold to foreign interests and saw billion dollar economies formed of it. But the television invention is constantly reborn in the nation and cannot be so easily taken from it. This method of protecting commercial electronics readily invites the participation of

suppliers from other countries, but it is *by nature* protected. Certainly this same property opened the Russians and Japanese markets to the Television Computer.

Vernon settled back in his motel room to watch TV. He would go back to China and finish his report. It would show how many positive impacts the Television Computer would have on the Chinese nation. He would argue that it is up to the central planning agencies to produce such good apps that the people would not want to produce more. He would indicate how the communist party, itself, could have communist party info apps. This would allow them to remain more firmly entrenched. He only hoped nobody would figure out how to pass info around in uncontrolled ways. Then he had his best idea. He thought about the Russian league that was funding the TCs in China.

"I will simply state that a way to keep the Russian league in check will be to infiltrate them. I will have to move to Moscow. I am the best candidate, since I understand the implications of the TC. Without my wife and kids, I will not be convincing. They have to go with me on my mission." He realized this would not work. What he did not know was that Lian was already arranging exit visas for his family.

Then he had his best idea, "I will let the TC take care of the Chinese."

He pressed the INFO button. His TC TV had a message from the Atlanta Police Department. "Mr. Williams murderer has been found. The suspects are members of a Chinese manufacturing delegation taken into custody in San Francisco as they were trying to flee the country."

"I guess it was a good idea that I phoned in the tip to Mr. Crenshaw." He thought, smiling to himself.

What he did not know was that Mr. Crenshaw's Find William's Murderer app had worked. A member of the Chinese

manufacturing mission had subscribed from his hotel room in Atlanta before proceeding to San Francisco. TC info directed at the Chinese guy's TC in his San Francisco motel room set him off to leave the country. It said his manufacturing mission had been implicated in the murder but they were last seen in Atlanta. The guy did not know that he was the only one who saw that info. Three hours detention at the San Francisco airport was enough to crack him. They threatened him with making the names and nationalities of the culprits public and sending them back to China.

What people first saw.

Very few people with interests in competing mediums agree with this, but the cable industry made the Television Computer possible. The most important achievement was making sure that when someone plugs a Television Computer into cable that the Television Computer immediately comes alive and provides services. The services began with simple TV program listings, TC app listings, and the capability to cause the TC to remind people about shows they wanted to watch.

The local ads took off when newspapers agreed to run the publishing services. Newspapers later noticed that people would pay to get news and local weather by television. Early on people learned that they can buy a "TV Controls" program for their local TC and that this, through message passing, would allow broadcast applications to control the TV channel and volume. A lot of people liked scheduling applications that censured shows available to the children or sensitive relatives. Of particular interest to people with graphics versions of the Television Computer were maps that showed how to get from the home or office to a desired location.

Finally, there was an amazing number of applications that were downloaded and used on PCs, not TCs. People found that info did not simply have to be a human readable message. Devices that controlled houses were a natural. This included internal house broadcasts from various devices that the Television Computer could monitor as a video stream and devices

that allowed apps on the Television Computer to monitor house parameters and make friendly suggestions on how to save money or avoid brownouts.

People like it if the Television reminds them that now they can make a telephone call with a 30% savings. Nobody wanted to know the times, they wanted to know when the time comes. Furthermore, nobody wanted to go to the trouble of finding the computer program and setting up the computer. They just wanted to be reminded while watching TV or working in the kitchen. Or, working anywhere, for that matter.

Randy went home to wife and kids. "I'm looking forward to the golf game tomorrow."

His wife sighed. "This guy Nello, that you met. Should we invite him to dinner sometime?"

"Yes. He is an OK guy. He could be an asset if I get that contract from the Ministry of Commerce of Libya."

"You and your business. Let's go out for dinner tonight. The TC said there is a neat new Italian restaurant about a half a mile from here," said Marilyn.

"You know, I have been eating away from home for two weeks. Do you want to just order dinner in? Let's look at what we can order." Randy pressed the APPS button, selected the Eat Dinner In App, and starting checking for some nearby places that would deliver.

Marilyn clicked her remote. The TV went off. "Nope, we go out."

"Yea, Dad," said Randy Jr. And they did.

The next four years. For the most part the idea of the Television Computer has come of age. The next steps involve using the Television Computer not just as a means of involving

people in good industry, but also in raising the competence of people in an ethical sense. The Television Computer will become fully interactive one of these years. They are gaining memory capacity and processor speed by the year. A good robot that is interactive might also express its opinions.

The ultimate destiny of the Television Computer is to provide a good role model. The Television Computer can be the first household robot that does what one wants without having to ask for it. One simply asks for the service to start. This is a bit dissimilar to Asimov's Laws of Robotics: a robot must not harm a person, but a robot, C3PO style, should set a good example for people to follow. This must certainly be the logical outcome of robotics and out of so transfixing a device as television.

Perhaps the message, the TV program, may never be ethical, but the medium, the TV itself, should be. People do not want to have a Television around that is nasty and not nice. Marshall McMcLuhan's observation was apt:

"TV is a medium that rejects the sharp personality and favors the presentation of processes rather than of products." (*Understanding Media: The Extensions of Man*, 1964).

THE TELEVISION AS ROBOT SERVANT

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Abstract

Television and computing have an interesting intersection in the topic of how to put computer software into the television infrastructure. It is widely recognized that the result is a home information appliance. However, despite previous commercial experimentation, such an appliance has not emerged as successful. Perhaps there is only a deficiency in properly conceptualizing the appliance. In keeping with this theme, this paper presents a theory of why people value information. Using this theory as a design aid in the creation of future home information appliances should improve their chances of commercial success.

Background

I walked into the family room and asked the TV if anything interesting happened today. It said that there is going to be a township meeting tonight that is going to discuss raising the school tax retroactively. Thought you might be interested.

Next morning, said "hi" to the TV. It said a semi-truck jackknifed on the expressway into work. A better route would be through Norcross.

That night, told the TV I need to eat out alone. It said the Italian place down the street was having a special on subs -- half price. No other recommendations.

If television sets get smart, isn't this the best way? Television attracts us because it services our need for entertainment, sports, and news. Could it not also service our need for other kinds of information? This question is old, and has been addressed by Sunday morning programming, PBS, C-SPAN and Court TV. But the question takes on new meaning when we ask if digital interactive (smart) TV can service our need for other kinds of information. Others have searched for the "killer" information service which will guarantee the success of smart TV. There may not be a single "killer" information service in the new age, but there may be principles that govern what works and what does

not work. We think the right place to start is to answer the question "why is information valued?"

News conveys information that is valued because it is timely. Information also has value because it is pertinent to the locale and to personal needs. Television is a great servant because it pleasantly conveys pertinent information. The information that it currently conveys is a small subset of the information that people desire in day to day living. Our group has asked how far one can extend the information range of TV and remain entrancing. The answer is surprising and not quite as impossible as it sounds.

The current work was begun in late 1988 and early 1989 as an investigation of how to add "software to television." It had become obvious that television sets, within a decade, would become more computer-like in composition. For dozens of reasons, this was inevitable. For one, the delivery of multiple, compressed, digital video channels, a necessity in conserving precious electromagnetic spectrum space, meant that TVs were going to contain processors and memories. But using the computer to simply service the video programming requirements of television seems a grotesque under-utilization of the smart TV. We ask how to maximize that utilization without demanding too much of the rest of the infrastructure. The idea is to enhance the functionality of future computer software in the TV.

To a group such as ours that has been building systems capable of highly skilled perception, the answer, on its surface, is fairly obvious. Equip the television with knowledge of "who, what, and where it is," and then let it "watch" its own environment and "converse" with the humans out there. The television's environment would, naturally, be the cable feed (or satellite, broadcast, or video dial tone feed). "Conversing" could be through speech recognition and voice synthesis, and it could be through remote control buttons, text, and graphics. The television set then becomes the robot servant: like a Star Wars C3PO without arms or legs.

Avoiding Past Mistakes

The smart TV is a very different concept from the "computer." It is strictly an information servant. A computer is an information tool that requires skill to operate. It takes work to operate. Such an information tool on the television set seems quite wrong headed. In fact, such a thing has been tried many times before. The original information tool was videotex. This constantly re-broadcast some number of "pages" or screens. Usually only a few hundred screens are rebroadcast every few seconds. With enough effort, it is possible to find a screen one is looking for. Tragically, videotex classically contains very little, if any, information of value. Broadcasting the same thing to everybody, in little screens, means that, basically, nobody is getting much of any relevance to them. Regular video news is harder hitting, you can get some information just from the pictures, and you don't have to search for the information. It is presented to you.

Some people have decided the problem is with "text services," as if real people don't read. However, we suspect that this is not the problem. We suspect the problem is that the information is, first, not presented in a humanly simple fashion, and, second, nearly totally irrelevant.

Smart TV means tiered interactive services. Interactivity between a consumer and his TV will be local and telecommunicated. The video game is a supreme example of pure local interactivity that has gained huge acceptance. Another locally interactive medium, CD ROM, is on the rise. Locally interactive services do engage people in ways they are willing to buy.

Telecommunicated interactivity, like automated buying services, has not been widely accepted. Like videotex, perhaps this is due to requiring too much viewer involvement.

Being driven by immediate demands of business, the experts look to home shopping services and other means of getting people to impulse-buy in directions they can incrementally charge for. Furthermore, they look to places where money is already being spent by people, in their homes, on their TVs. They look to videotape sales and rentals with the resulting "pay-per-view" conception, and to video games with the resulting "Sega Channel" and "Nintendo Channel." The information highway owners want new things to put on their highways and new ways to charge tolls. This activity can easily put too many demands on the viewer.

The television industry has been loath to relinquish control to the audience. Very powerful home TV boxes are being created by Hewlett-Packard, Panasonic, Silicon Graphics, Phillips, General Electric, General Instruments, Scientific Atlanta, and IBM. Yet companies persist in wanting to control or, as bad, monitor every action of the consumer.

We believe the smart TV should provide service without the details of the service being monitored by the provider. In cable, the "addressable decoder box," promulgated by the cable box makers General Instruments and Scientific Atlanta, implements the vision of a TV as a remote terminal for a large scale mainframe. Of course, the "mainframe" is really a "headend" here, but the idea is the same. This is fine but it does not follow that absolute control, all control except detailed show-product selecting, should reside in the headend.

Contrary to the popular view, giving up absolute control does not give up data security. Security does not require addressability of every action. We believe smart TVs can be smart about

what they can know and can be trusted to be responsible, like C3PO. Furthermore, there is no need to give up system control to software companies [8].

An interesting model of how smart TVsoftware might work is that of the Free Software Foundation in Boston. They produce great software that is distributed free and in source form. We do the same thing at CMU with the MACH operating system. FSF software is "copylefted," meaning that if you modify their code, they own it, and they are going to give your modifications away in source form. This naturally generates standards that are seriously open because the basic system and tool software is complete and free.

Providing Useful Information

The essence of the servant is that it assists without asking. Things are accomplished without thinking to accomplish them because the servant does the thinking. Thinking and making decisions are things people do not like to do. If you have to think, to make a decision, then what is the servant really for? Perhaps the whole crux of the matter is how to architect a smart TV system in such a way that decisions, thinking, is minimized while the value of the information is maximized. In descriptive algebra, we can define the simplest form of a utility function:

$$U = I / T \tag{1}$$

The **U**tility (or value) is the **I**nformation value divided by the amount of **T**hinking (number of decisions). Interestingly, **I** and **T** can be expressed in exactly the same units of information value (bits or, alternatively, "yes-no" decisions). In this case, utility is a dimensionless quantity because it divides bits of effective information value (the elimination of uncertainty) by the

information value of the current decision (the current elimination of uncertainty).

This function can logically be rewritten purely in a time sense. Information uncertainty was reduced at some prior time that reduces the uncertainty now and therefore requires fewer decisions now. Put simply, we have:

$$U_{t_n} = I_{t_{<n}} / T_{t_n} \tag{2}$$

The utility depends strictly on what decisions are made for you prior to the time, t_n, that you make a decision. For convenience, returning to the first form of this equation, we can give Utility a unit value in bits of information value by simply squaring the numerator:

$$U = I^2 / T \tag{3}$$

This says, also, that the value of past decisions in utility plays an exponential role compared to the value of the present decision. The term need not be squared. It would be interesting to know:

$$U = I^k / T \tag{4}$$

where k is unknown and must be discovered by experimentation. This, more general, utility function would be preferred if we consider utility, U, to carry a reduction of uncertainty. Many people have noted that the value of the cellular telephone, TV news, pagers, and the like, is the reduction in uncertainty. Reduction in uncertainty is a gut thing, not just a mathematical one. One could argue, we believe, that most entertainment value is profitably viewed as reduction of uncertainty (creating and resolving it). Certainly, this is true of narrative structure, and narrative structure is generally regarded as the definitive form of storytelling. Music and other art forms have similar structures of creation and resolution.

In this model, people figure out how valuable information is to them -- always. There is always at least one decision (or a fraction of one) that pertains to the utility of the current information (since a divide by zero is not allowed.) Furthermore, utility can zoom to near infinity. It is possible to catch you exactly right. In other words, it is possible to create utility that is hugely valuable if not priceless.

We believe that the value of television is in a high value utility function: the simplicity of the decision in channel changing and then simply watching. It is well-known that most of the time most people randomly flick channels. I propose this means the system is creating fractional denominators (thinking decisions) that, by the formula, means high utility value even with relatively poor information. Another interesting experimental number might be the median density in conscious (non-motor) decisions per hour that people make during their waking hours. I suspect that number is low enough that many "experts" on "interactive TV" would have to think twice, and perhaps revise their revenue projections.

The summary of this speculative analysis is that utility in interactive TV comes from minimizing viewer decisions while maximizing information quality from prior decisions. The prior decisions can come from others or from the viewer. A prior decision made by oneself is the setup cost for the information service. An example is the decisions necessary to find and get an information service (e.g., Macy's Home Shopper) that one will later use.

If decisions come from others, they must be broadcast to be efficient and economical. In other words, one decision by one person must be the decision for more than one other person. This further modifies the equation (again, eliminating the time and exponential notation for simplicity in presentation):

$$U = (I_{self} + I_{other}) / T \tag{5}$$

The decisions by the other must replace decisions by the self to be counted here. The efficiency of the system is enhanced if the I_{other} is itself the result of a broadcast multiplication factor, **B**, the bigger the better:

$$I'_{other} = I_{other} / B \qquad (6)$$

or

$$U = (I_{self} + B \, I'_{other}) / T \qquad (7)$$

In other words, one I'_{other} decision is multiplied by the number of people it effects. The larger the number, the more efficient the system is in reducing the "overall decision loading" and thus the service cost of interactive TV.

Several senior cable, telephone, and computer people have warned sternly against the use of the term "broadcast." However, our use is generic and should not be thought of as necessarily meaning airwaves. Indeed, magazines, newspapers, and CD ROM publishers are broadcasters -- as are all cable operators and the networks that inhabit the cables. We find the word "network" hard to swallow since "network" implies interaction (as in "networking"). The factor **B** represents the power of broadcasting, not of networking in general.

This is still only part of the story. There are other forms of decisions besides those that are laboriously made by others and those laboriously made by oneself. There is a derivative multiplier in the automaton. This is the idea of a robot actively making a decision not explicitly anticipated by the creator of the robot. Call this an automaton factor, **A.** This applies to the decisions that are involved in programming the automaton and those made by the automaton. The automaton factor is also a multiplier. Thus,

$$U = A \, (I_{self} + B \, I_{other}) / T \qquad (8)$$

And, as we said earlier, the automaton factor will be exponential if we assume the utility, the value to the individual, is itself a reduction in uncertainty.

So, lets put a little meat on this analysis of how hard it is to create the smart TV. Our analysis says that people will get more utility out of situations that (a) minimize the current decision requirement, (b) utilize the decision requirements of others that are broadcast to them, (c) utilize as many past decisions of themselves (without adding to the historical decision load), and (d) utilize automatons that can leverage decisions. Furthermore, the argument is that this analysis is complete and deals with entertainment, news, or any useful "information event."

Actually, the analysis is not complete. There are other assumptions not revealed in this utility function. One has to do with the degree, as opposed to the tier level, of interactivity. Degree of interactivity, we believe, has to do with the responsiveness of a system: the time to wait for an expected response. Non-interactive systems in which a wait is required are less useful than those that provide near instant response. However, systems with predictable delays are not perceived as bad. The "broadcaster's contract" is a contract to supply a program at a stated time and place. As long as people know when to expect something, and can reliably get it at the promised time and place, the utility is not greatly diminished. We assume, through tiered interactivity, that there will, in general, be either negligible waits or established broadcaster's contracts.

Some Practical Instances

A low utility results from the use of a CD-ROM Encyclopedia for a high uncertainty search. This is where the person does not know exactly what he wants. For example, he knows there was

a famous jurist in 1920 who made some clever remarks. He wants to check the remarks to find out if they would be appropriate for a talk he is giving on freedom of speech.

A much better utility for the CD-ROM Encyclopedia is in a low uncertainty search. The thinking (denominator) is much smaller. The person already knows the man's name and just checks the entry for "Oliver Wendell Holmes" for the saying "a clear and present danger."

We would argue that there are a great number of high uncertainty search problems in people's lives. These include simple questions like "Is the traffic bad from here to work this morning?" The uncertainty is not in how to ask the question, but who to ask. Who knows the answer? Another one is "What is murder like?," "What is sex like?," or "What is war like?" These are high uncertainty search problems because of difficulty in seeing how to gain the understanding. The entertainment industry has solved these search problems and really helped people explore the answers through character development and plot. Anybody can be a Greek god nowadays and watch those puny mortals on TV. Soon we may be able to control their puny fates! Here the high uncertainty problem has a low cost decision to watch and a great deal of information value in the revelations made by others and made affordable by broadcast.

The automaton, or what we have called, the friendly robot on the home TV, is a watcher whose environment is a high volume broadcast information stream. Pagers are well accepted watchers but they have only rudimentary intelligence and respond to lower volume broadcast information streams. The watcher works because a person can assign it a duty to watch out for something. For example, it could be set up to watch for problems in getting to work in the morning. Then, any time that it generates a useful event, it is generating a high information value event with only some set up

(I_{self}), that was perhaps done over a year prior, and a decision (T) to watch a channel, or perhaps any channel, on TV. Or even easier, just to look and check out if the message light is on (so $T=1$ bit).

Another automaton type is a gopher that actively seeks information of value out of large databases. In the example of the encyclopedia, one simply gives the order "find the name and quips of the jurist in 1920 who was famous on the topic of freedom." The automaton itself has to develop appropriate search strategies on the encyclopedia. This type of gopher is not available in the foreseeable future. However, a gopher that automatically wakes up at 7 am and checks the traffic database for a possible problem going to work could perfectly emulate the watcher.

Gophers break down when there is a broadcast event. All gophers going for the same database at exactly the same time would not be good. So, for example, the winner of the football game or the movement of a hurricane are best monitored by watchers, not gophers.

There are two sources of input in interactive TV. One is the data source (CD or cable), and the other is the viewer input (remote control). Intelligence can be applied to both.

The data source will be filtered and composed. In effect only some information from the source will be interesting. Data composition is not well studied but permits inference. The simplest form is to count instances of a message of interest as in "found 5 cars in the category you are looking for." More interesting is a composition that finds a nearest chinese restaurant but also a traffic jam that needs to be avoided between here and there. This is a composition problem.

Intelligence applied to the viewer input consists of active display changing whether it be the state of Super Mario, the straightening of

hand drawn lines, or text completion in a phone book look up. Information utility is what is attractive on interactive TV. If the utility is only provided by viewer input simplification, utility would be low. This is like a pong game without a bounce. The data source dominates the utility. How the automaton is intelligent about the data source is most critical. Like any idea that can now be discussed, the idea of data automatons is old. "Intelligent agents" were deeply analysed in the early 1970s. Making these computerized agents work with high utility values is a different matter.

Agents are best that accomplish the narrowest function. The best appear to be incredibly simple services that give incredibly good information. An example would be the traffic-to-work service. The set-up is to indicate that you want this to work all the time for as long as you do not trash it. Then you indicate your location and the office location (perhaps by street addresses). This is the I_{self} cost (essentially 3 bits). The automaton multiplier, A, is enormous since the automaton does the customization, the I_{other} value is high because somebody wrote a fairly complicated computer program, and the "think cost," T, is essentially fractional. The result is an extremely high utility value for any information event which now occurs with this information service.

In effect, the conclusion is that we should not use interactive TV to get greedy and have people shop by the instant. People don't like to make a lot of decisions. Rather we should use interactive TV to create the ultimate narrowcasts. This can be done with good content producers and with a broadcast structure underpinning interactive TV. Within the communities of the two key types of content producers, entertainment artists and software automaton producers, there are incredibly gifted people who want to strut their stuff. But don't forget that nearly everybody knows something of great

interest to a respectable number of other people. Smart TV shouldn't leave anyone behind.

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World Wide Web

Robert Thibadeau

November 30, 1993

I never thought I would see the day

When books looked superfluous.

I saw, the day before yesterday,

the world.

I leapt about, from Japan, to Here, to

Australia

to Finland,

to Italy.

Like it was nothing.

And I got deep

Deep

Into people

What they were thinking and doing

What they wanted and thought

I might like.

This is what a book was supposed to be.

But this was much better.

I made up the plot, and I discovered the real story.

All right there. Right then. And,

like the world,

It would never repeat again.

Oh.

I really would like to have books with their tree paper

go the way of the dinosaur.

This is nearly it.

It is a place to really learn.

Will Internet become the dragon?

You know, the house dragon. The oldest dragon. From China.

You know, the

Dragon of Peace holding the Pearl of Everlasting Life.