



Computers and CyberSpace

Cyberspace -- the computing space within computers -- is awash with operating applications, maintenance activities, applets, and even occasional personalities.

Once computer and brain circuitry reaches a threshold level of sophistication, the computing space becomes an environment in which packages of software move and perform their functions.

The internal operations of computers are (in most cases) transparent to the user. Data is input into the computer, processed into information, and ultimately output.

Inside The Computer. The environment inside the computer becomes important with the advent of artificial intelligences and recorded personalities. Personalities and artificial intelligences are basically programs that can move through circuitry and networks.

The Cyberspace Metaphor. Given their size and sophistication, this interior computation circuitry of computers and networks can be best understood as a broad space, marked off into locations and bounded by barriers.

THE CHARTS

The four computer-related charts show the basic structure and operation of computers.

- Chart 1. Computers.
- Chart 2. Processes.
- Chart 3. Applets.
- Chart 4. Personalities.

UNDERSTANDING COMPUTERS

The physical device is the Computer: a set of electronic (or photonic or positronic or fluidic) circuits which process data according to some set of instructions.

A Computer has an Architecture: an internal structure of cells and connections which governs its operations.

Types of Computers

Computers are identified by the basic principles of their operation.

Electronic Computer. A Computer using electronic circuits. Electronic Computers are by far the most commonly encountered type.

Photonic Computer. A Computer using photonic or fiber optic circuits. Photonic Computers are resistant to EMP Effects, have lower power requirements, and have reduced waste heat output when compared to Electronic Computers.

Fluidic Computer. A Computer using gas or liquid flow circuits. Fluidic computers are resistant to EMP Effects, have lower power requirements, and have reduced waste heat output when compared to Electronic Computers. They are sensitive to temperature variations.

THE ELEMENTS OF CYBERSPACE

Delving deeper into Computers reveals their internal structure: Cyberspace. Cyberspace is a set of interconnected cells (locations) for operating computer programs, processes, applets, and data streams.

Users. People outside the computer system who use the computer through control consoles are Users.

Cells. The foundation of Cyberspace is its structure of cells. Each cell is a location for an activity within the computer. A map of the cells in a computer draws each location and shows connections between them. The (and

map draws a square (or other polygon) grid showing the computer's total number of cells; sides which touch are connected.

Processes. Some cells are permanently occupied by Processes. A process is a large-scale program dedicated to a specific activity. Starship Life Support is a process in the starship's computer.

Applets. In contrast to Processes, Applets are small, temporary, mobile programs which roam throughout the computer. Applets perform many maintenance and protection functions. A Courier Applet carries targeted data messages between processes. A Censor evaluates data streams and applets for malware.

Data Streams. The underlying circuitry carries a continual flow of data streams between processes. This flow is constant as long as the computer is operating, and for all practical purposes invisible.

Connectors. The lines linking computers are Connectors: they may be wired or wireless.

Programs. For terminology purposes, Processes and Applets are both Programs.

Priority

Every Process and Applet within the computer has a Priority: a number which shows its relative importance in the overall hierarchy of the computer.

Under normal circumstances, Priority is a number from 1 to 6.

Moving In Cyberspace

Processes are immobile, being assigned more or less permanent locations within the grid of cells.

Applets roam at will within the computer, subject to specific limits:

Applets may move without limit through empty cells, or through any Process or Applet with a lower Priority.

An Applet stops when it moves next to a Program with equal or higher priority. Applets with equal Priority can never move into the same Cell.

An Applet which stops in a cell with a Program with lower Priority stops that Program for as long as they both occupy the same cell.

An Applet which may move onto a Connector, at which point it ends movement for the current turn. It begins its next turn of movement at the other end of the connector.

Stacking In A Cell. A cell can contain one Process and any number of Applets as long as each program has a different Priority (and only the highest Priority program can be functional).

IFFN Identification Friend or Foe or Neutral

All Programs native to a specific computer (or network) carry a visible IFFN Tag which identifies them as Friend. Programs with strange or unrecognized Tags are identified as Foe.

Friends are ignored by Friends unless they initiate attacks; Foes are automatically attacked.

Ignore. Some tags indicate the Program is Neutral and should be ignored unless it starts to overload the system.

Neutrals normally roam freely within cyberspace. If too many Neutrals are present and begin to overload the system, settings may change to exclude or destroy Neutrals. This is all much more Complex, with safeguards, encrypted identifications, and other details.

Conflict in Cyberspace

Programs can come into conflict with other Programs:

Processes are passive; they cannot attack other Processes or Applets. They depend on protective Applets to defend them.

Some Applets can destroy Processes using their available skill sets. An Applet can destroy one Program per turn (as the last activity in the turn).

Any Applet can attack any other Applet to which it is adjacent.

Applet Conflict. When applets clash, they resolve the conflict through comparison of assets. The applet with the greater assets prevails (tied applets are immobilized). A losing applet is destroyed.

Applet1 Assets	vs	Applet2 Assets
C4+C5+C6+	vs	C4+C5+C6+
Priority + Skills		Priority + Skills

If AI or Personality: Add Good Flux.

APPLET TYPES

Type	Description
Cleaner	Clears obsolete or useless code.
Fixer	Repairs chance variations or faults.
Phage	Destroys malware.
Courier	Carries internal messages and data..
Popup	Carries messages to outputs.
Censor	Evaluates all Applets passing through it.
AI AyEye	Artificial Intelligence.
Personality	Recorded organic personality.
Virus	Creates applets from within a Process.

UNDERSTANDING APPLETS

An **Applet** is mobile programming that performs support, maintenance, and internal housekeeping functions. Applets

roam from location to location, cleaning out vacated locations, searching and destroying malware, and transporting priority data across networks.

Applets are rudimentary personalities with relatively low intelligence and relatively simple missions.

Applets are created and erased as needed.

For example, a priority message must be transmitted to another computer. The originating process creates (spawns?) an applet around the message and sends it on its way. This specific applet travels through the circuitry, attached networks, as a transmission, or even in a wafer or chip, until it ultimately reaches its destination. Recognition codes within the applet confirm the destination and deliver the message.

THE ELEMENTS OF THE APPLETS

C4	Intelligence
C5	Education or Training or Instinct
C6	Social Standing or Charisma (but not Caste)
CS	Sanity
	A limited set of Skills or Knowledges or Talents
	A set of unique Memories
	A sense of Purpose and of Self (including IFFN).
	Special Features: Priority. Expiration

Characteristics. An Applet may have one or more characteristics C4 C5 C6.

Sanity. An Applet may malfunction if it fails a Sanity Check.

Skills. An Applet may have one or more skills; usually a specialized Applet skill.

Memories. An Applet has Memories and is able to interact with other applets about them.

Purpose. An Applet has a sense of Purpose, usually hardwired, associated with its activities. The Applet has a sense of Self, including an ability to identify and be identified as a friend or foe (or neutral).

Priority. An Applet has a Priority established when it is created.

Expiration. An Applet has an Expiration and it dissolves when this date is reached.

Applet Duplication

Applets are self-directed and self-duplicating.

Any Applet may make identical duplicates of itself (the number it can make is equal to its Priority), but each duplicate is Priority one lower.

Applet Skills

An Applet is created with one skill (usually no more) which supports its mission or function.

Clean (Cleaner, Maintenance) is the ability to identify and erase obsolete or useless code, applets, or processes. Applets with Clean roam through cyberspace examining applets, processes, and data streams for expiration dates and faulty diagnostics. Those that it finds, it shreds, leaving behind empty cells.

Fix (Fixer, Repair) is the ability to identify minor software malfunctions and repair them. Applets with Fixer roam through cyberspace performing diagnostics for applets, processes, and data streams: when faults are found, they are repaired (if possible): expiration dates are reset, checksums repaired, software structures are reset to their original state.

Defend (Defender, Protect) is the ability to identify Foe (as defined by IFF) Applets and Processes and attack and destroy them. Applets with Defender roam through cyberspace examining the IFF status of applets and destroying those that cannot be verified as Friendly.

Destination (Goal) is the ability to navigate through cyberspace to an identified destination. Applets with Destination travel through cyberspace to an assigned Process in order to deliver a packet of information essential to that Process. A destination is not necessarily in the current computer or even the current network.

An Applet with Destination is a Courier.

Destination is distinct from Output, which is associated with carrying information to an assigned Output device.

Output is the ability to navigate through cyberspace to an identified output device. Applets with Output travel through cyberspace to an assigned Output device to deliver a packet of Output intended for display to a user. The output device is not necessarily in the current computer or even the current network.

An Applet with Output is a Popup.

Output is distinct from Destination, which is associated with carrying information to an assigned Process.

Censor (Anti-Virus, Anti-Malware) is the ability to evaluate all applets and data streams it encounters searching for malware (and especially for viruses).

An Applet with Censor repeatedly cycles its Priority 6-5-4-3-2-1-6.

Stealth (Clandestine) is the ability to conceal oneself from the evaluations and diagnostics of others. An Applet with Stealth can ignore evaluations by Clean, Fix, Defend, or Censor if its Stealth is greater than the opposing skill.

Programmer (Coding, Coder) is the ability to edit the software elements of Processes and Applets (including the elements of the Applet using the skill). Programming does not allow creating new code; the specific values required must be taken from (cut and pasted) other Applets in the same cell (including from oneself).

Programmer is not a skill generally available to created Applets; it is brought into an Applet through a Personality. For example, Eneri Dinsha, Programmer-4, records his personality; when it sends it into cyberspace, one of its available skills is Programmer-4.

For Example,

An Applet is generated with Clean. The Applet is a Phage, devoted to eating obsolete or expired code fragments. It located and attacks Applets which have passed their expiration date.

An Applet is generated with Fix. The Applet is a Fixer with a minor repair function: it roams in search of minor software flaws and repairs them.

An Applet is generated with Defend. The Applet is a Defender dedicated to seeking out and destroying Applets which fail an IFFN test.

An Astrogation Process generates an Applet with Destination Jump Drive Processor and is given a packet of data calculations about an upcoming Jump. The Courier Applet is a courier which makes its way through the on-board network to the Jump Drive Processor and delivers its packet (the Jump Drive Processor may generate its own Courier with an acknowledgement).

An Jump Drive Processor (having just received its data packet about an upcoming jump) generates an Applet with Output directed toward the Astrogator Display Console. The

Popup travels through the network to the ADC and notifies the astrogator that all is ready for the upcoming jump.

An Applet is generated with Censor. The Applet stations itself in a cell through which many Applets must pass (and which cannot be bypassed). A passing Popup is forced to stop when it moves adjacent to the higher priority Censor, which then evaluates it for malware. The Popup passes the evaluation; the Censor momentarily drops its Priority and the Popup proceeds on its way.

DATA PACKETS

A Data Packet is an encapsulated (in an Applet) set of data or information. It may be generated by a Processor or by a User.

Internal Data is basic output from one processor intended to be used as input by another processor. An Astrogation Processor outputs a data packet (calculations about an upcoming jump) and sends it to the Jump Drive Processor.

Internal Data is carried by Courier applets.

Console Output is information (progress reports, query responses, messages, emails) intended for display on a control console to be read (viewed, heard) by a User.

Console Output is carried by Popup Applets.

Virus is a set of Applet-producing instructions concealed within a Data Packet. Upon delivery to a Processor, the Data Packet tricks the Processor into creating the specified Applet (or great numbers of the Applet, or many different Applets).

The Xmail System

Some versions of the Xmail System use Neutral Output Applets. A message to a specific person is inserted into the Applet and thousands of copies are sent into the xmail system, carried by ships to hundreds of worlds.

When the recipient arrives on one of those worlds and checks an xmail terminal, his specific message pops up on the display console.

PERSONALITIES AND ARTIFICIAL INTELLIGENCES

A person can insert his Personality into a computer: special software wraps it in an Applet which enters the computer.

A person can establish a feedback loop with his Recorded Personality as it is run on a Computer and monitor its activities. The resulting effect is that the person feels like he is in the computer (the term is **jacked in**).

Jacking In. To monitor the activities of a Recorded Personality being run on a Computer, a person establishes a connection between his Wafer Jack and the computer.

When the person disconnects, the Recorded Personality continues in the computer until it dissipates.

The Personality

A Personality accurately reflects the characteristics of the User. The Applet is, in effect, the person, now inside the computer.

Artificial Intelligences

Some Personalities are artificially created.

WHAT CYBERSPACE LOOKS LIKE

At its simplest, cyberspace is sparse and bare; its locations filled with heaps of pulsating processes, and glowing streams of data flowing between them.

Skins. Personalities ranging through cyberspace may adopt their own favorite filters through which to view their surroundings:

Prehistoric Landscapes littered with valuable gems and roamed by dinosaurs.

Medieval landscapes filled with castles, towns, and villages, and threatened by dragons, plague, and random storms.

Contemporary Interplanetary Space populated by planets and satellites and swept by stellar flares and radiation storms.

But in each Skin, the elements are the same: locations which process data, operating stationary processes, and roaming applets performing a variety of functions.

Internal Architecture. The environment within cyberspace is a broad plane of locations arranged in a regular pattern. Each location has a distinct number of connections to neighboring locations. This number identifies its architecture.

For example, Architecture-4 indicates each location has four connections to adjacent locations (which is a square grid). Architecture-6 indicates six connections (which is a hexagon grid). Any number of connections are possible, although Architecture 1 and Architecture-2 appear to be impractical.

Many substantial variations of Architecture are possible:

The edges of the plane may wrap (like a cylinder) or the plane may be the surface of a sphere.

Locations may have varying or random numbers of connections.

Y-Connectors and X-Connectors linking locations with multiple other locations

Standard Imperial Computer Architecture is a compact bounded flat plane with a square grid.

POSITRONIC BRAINS

Positronic brains begin as blank slates. A positronic brain is activated, giving it consciousness and self-awareness. It is immediately connected to a flash learning system which floods the brain with information and the techniques and abilities to use it.

In a matter of weeks, the brain has reached the equivalent of Life Stage 3 and is ready to be installed in a robot body.

Cannot Be Recorded or Overlaid. A positronic brain is dependent on the random structure of the noble metal sponge. Its personality can be imitated (by an expert system), but it cannot be recorded. Personalities cannot be overlaid on it or implanted.

MISSILE BRAINS

Missiles can be equipped with a variety of guidance and control systems.

Hardwired (C+S)= 5

The Missile is hardwired with a rudimentary decision-making systems. It operates independently once launched.

Minimum Missile Size = 3.

Operator Guided (C+S)= Operator

The Missile is guided by a Gunner in the launching Mount. The Missile takes its C+S from the Characteristic and Skill of the Operator.

Distance Effects. Guidance by an Operator at a distance ultimately declines in quality. (C+S) is modified by minus

World Range (R=). If (C+S)-R becomes less than 5, the Missile reverts to Hardwired (C+S)=5.

Attention Effects. The Operator must be participating in the Guidance process when the missile attacks. If not, the Missile reverts to Hard-Wired (C+S)=5.

Minimum Missile Size = 4.

Self-Aware (C+S)= varies

Self-Aware missiles are equipped with a Brain (Electronic, Positronic, Semi-Organic, usually not Organic) which operates the missile and guides it to its target.

Self-Aware Brains are constantly fed sensor data about the current ship's position and the location of other ships and targets in the area. When in jump, the Brains are fed random situations and information.

The Brains are constantly gaming the information, competing with each other for high scores and other rewards.

Although Missile Brains communicate with each other, there are no communications channels with the ship or crew; it is important that Brains never learn that, when actually deployed, the end of the mission is final.

Self-Aware Missiles self-destruct if their mission is unsuccessful.

DataCasters. One purpose of DataCasters is to communicate with Self-Aware Missile Brains. Success shocks the Brain into inaction or even to turning on its launchers.

Self-Aware (C+S). C+S for a Self-Aware Missile is determined at the time of Launch

C= 6 + 1D

S= 1D

Plus Flux.

Minimum Missile Size = 5.

Download. A Missile Gunner can Download his Personality into a Missile (or several missiles) and send them on their way.

Each missile is guided by the personality of the Operator (which would dissipate anyway after several days).

Minimum Missile Size = 5.

Eneri Dinsha Drives Across The Continent

For example, Eneri Dinsha is driving a GroundCar. There is a computer in place between the controls and the vehicle itself. That computer may include sophisticated braking features; finely tuned reactive suspension, and an array of console information. Nevertheless, driving tasks are resolved using Eneri's characteristic and skill.

For example, Eneri Dinsha is driving a GroundCar equipped with a computer which has a P0 Positronic Brain as its System Process (but not a Component process). Eneri starts to fall asleep at the controls; the On Board Brain senses his erratic driving and speaks to him: "Alert! Your driving is erratic!"

For example, Eneri Dinsha is driving a GroundCar equipped with a computer which has a P0 Positronic Brain as its System Process, and with a Vehicle Component Process. Eneri starts to fall asleep at the controls; the On Board Brain senses his erratic driving and takes over the controls. Since a P0 has Int=1 and Vehicle-1D (=4), it isn't a very good driver, but it can at least pull the vehicle to the side of the road, crank up the heating system, and flash the interior lights to

get Eneri's attention: "Alert! You were driving erratically. You should get some sleep before we continue."

Finally, for example, Eneri Dinsha is driving a GroundCar equipped with a computer which has an S2 Semi-Organic Brain (Int=2D, Skill=2D) and a Vehicle Component Process. Eneri starts to fall asleep at the controls. The On Board Brain senses his erratic driving and takes over the controls, driving the vehicle through the night. Eneri wakes up in the morning as the vehicle is just arriving at its destination.

CYBERSPACE AND SPACE COMBAT

Resolving conflict in CyberSpace during space combat is overlong and distracting. Instead, use the following:

A Virus successfully introduced onto a ship disables the Component at the Hit Location.

In each successive Combat Round, the Virus may attack an adjacent Hit Location and succeeds if $1D < \text{Computer} + \text{Virus}$.

For example, a Virus is assigned a value = $1D = 3$. It attacks an adjacent Hit Location Power Plant controlled by $\text{Computer}/2$. It must roll $1D$ for $2+3$ or less = 5. If successful, that location is disabled.

A Virus is isolated if all computer connections are cut between the Virus disabled locations and all other hit locations.